SCIENTIFIC AMERICAN

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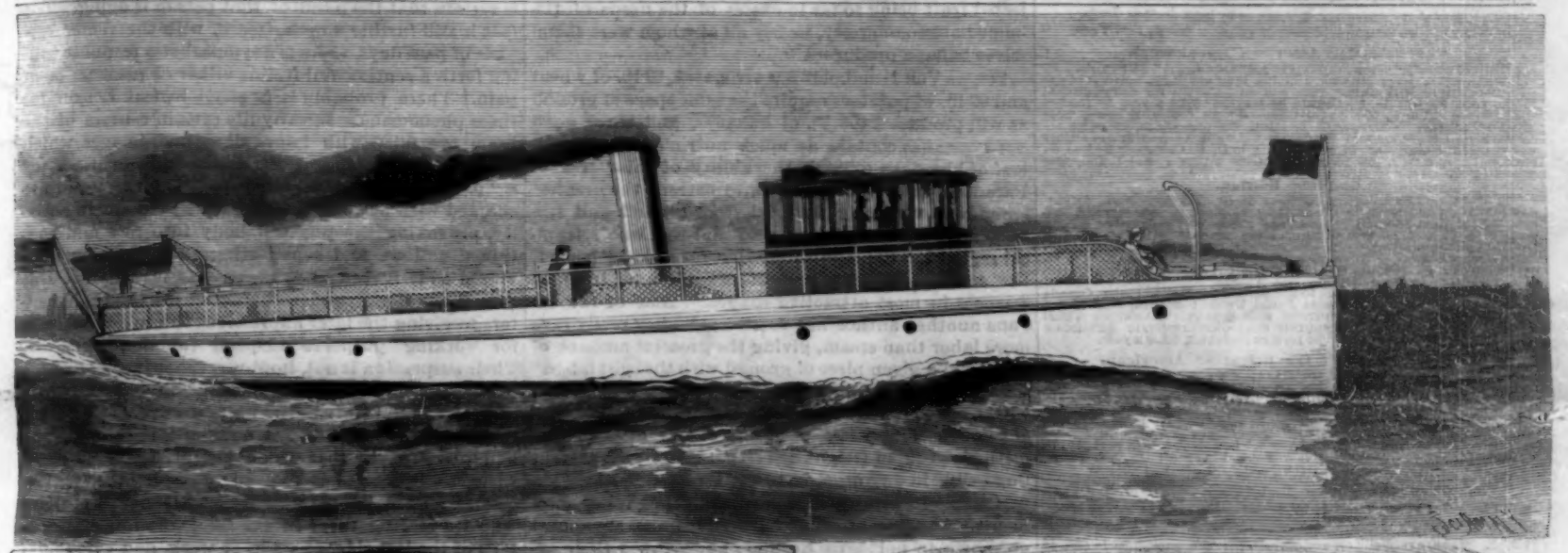

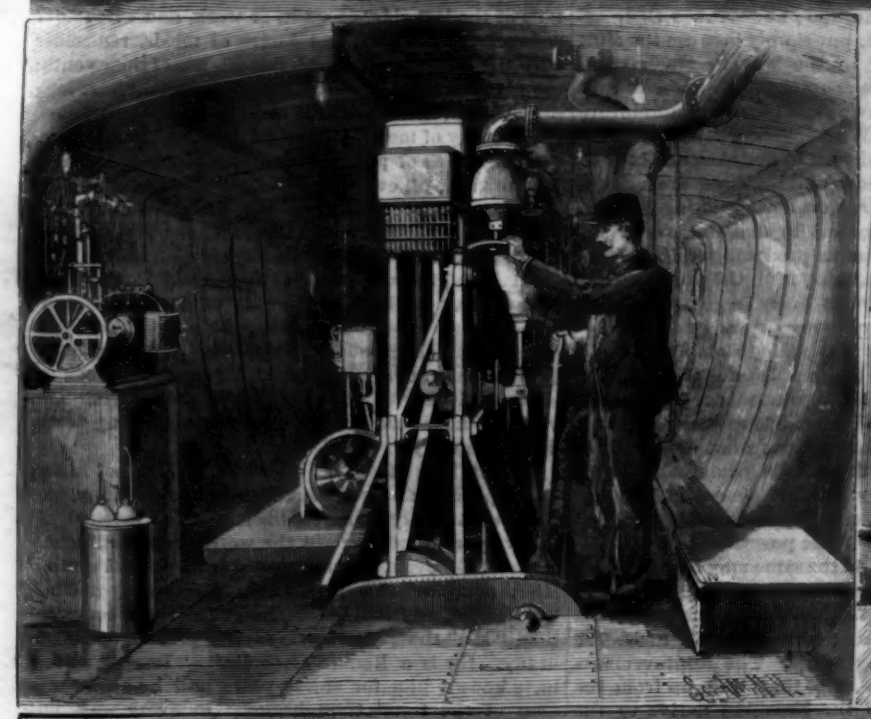

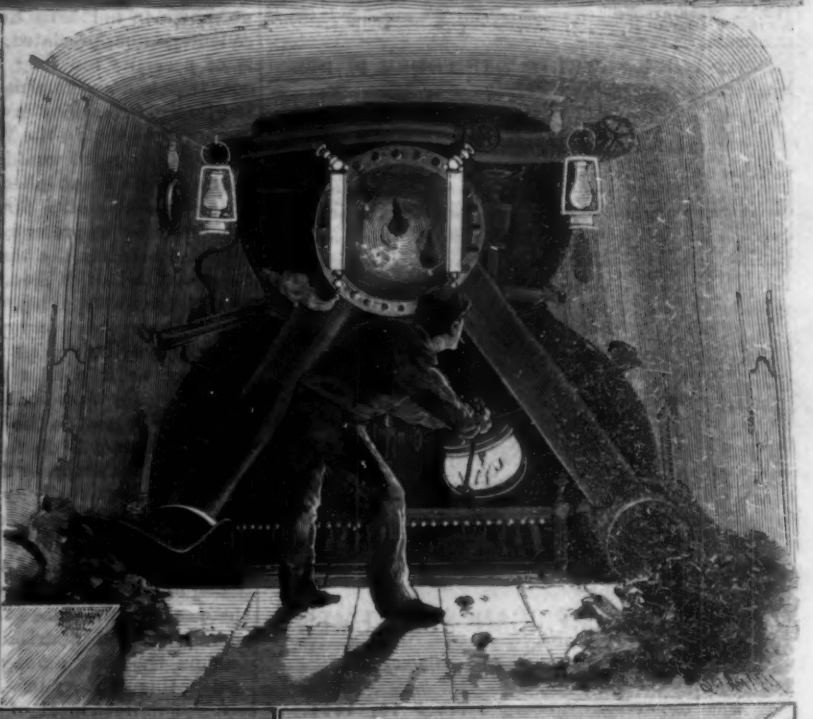

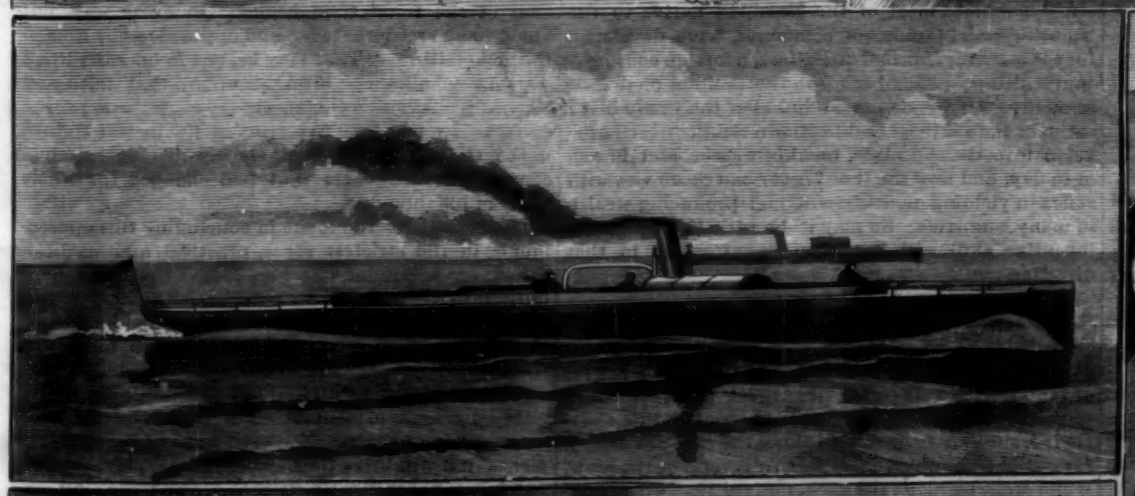

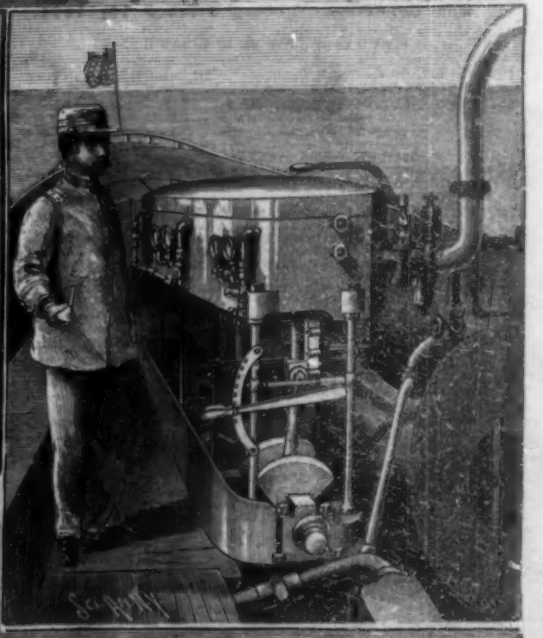

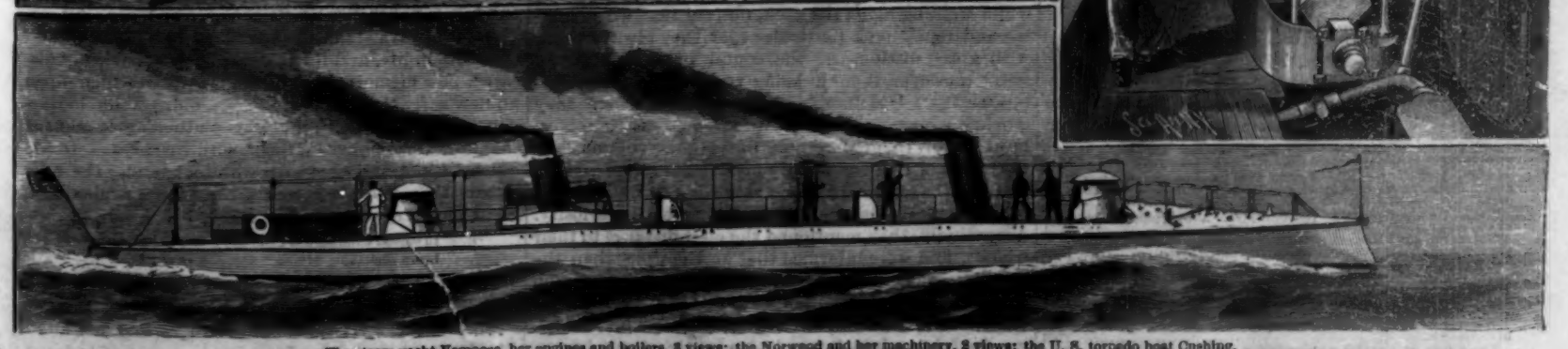

The steam yacht Vamoose, her engines and boilers, 3 views; the Norwood and her machinery, 2 views; the U. S. torpedo boat Cushing.

A FAST TRIO—THE TORPEDO BOAT CUSHING, THE NORWOOD, AND THE VAMOOSE.—[See page 220.]

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 10, 1891.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 823.

For the Week Ending October 10, 1891.

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THE BREAD OF THE TROPICS.

It is safe to say that in Jamaica alone, whence we derive nearly one-third of our banana supply, the waste amounts up into the hundreds of thousands of bunches each year, though less than one-tenth of the available banana land is yet under cultivation. Bunches that are undersized, or that contain a certain proportion of undeveloped "fingers," are rigorously cast out by the buyers, and at many of the ports these may be had for the asking or at a purely nominal price. The writer has often seen such, and bunches that were too far advanced in the ripening process to stand shipping, left on the wharf after a vessel's departure, with no one anxious to claim them, the supply of rejected fruit being so far in excess of the needs of the immediate community, nearly all of whom were themselves banana producers.

Yet, as Von Humboldt has estimated, 33 lb. of wheat and 99 lb. of potatoes require the same space of ground as will produce 4,000 lb. of bananas, and three good sized bananas contain as much nutriment as a 14 oz. loaf of bread, so great is the ability of this "tree of Paradise," *Musa paradisiaca*, to extract the greatest amount of vitalizing material from ground and sun and rain. It has well been said that this whole tropical region is "the land where that rare old alchemist, the sun, packs earth's most delicate and fragrant essences in most attractive shapes." And of the banana another author has written: "They really save more labor than steam, giving the greatest amount of food from a given piece of ground with the least labor."

This "bread of the tropics," however, while it will withstand so much handling as is required to get it to our northern markets, by means of our most perfect methods of rapid freight delivery, a system at present impossible in any other country, is not sufficiently imperishable to withstand a much longer series of shipments. At present the fine-flavored bananas are almost unknown in northern Europe; not because their excellence is unappreciated, but simply because the fruit is of necessity too long by the way to reach those countries in a marketable condition. So it comes that two lines of inventions having to do with banana culture are sorely needed in the West Indies, where with them the banana output would soon be doubled, and in time might easily be multiplied tenfold. These are a desiccating process and a flour or meal making process. The former is at present most in demand, and wherever one travels in the banana-producing regions, from Demerara to British Honduras, from Colon to Samana Bay, the cry will be heard at every large plantation, "Oh! if some one would only invent and perfect a drying or preserving process that could be depended on." The man or men who can put before the banana growers of the West Indies, who send over $4,000,000 worth of this fruit to the United States each year, any system which will do for bananas what is now done for the fig, the grape, or the corinth, commonly known as "dried currants;" or who can succeed in treating that fruit as well as peaches, apricots, and prunellas now are, will find himself the possessor of a wealth-producing invention. And the same may be safely predicted of any system which will succeed in putting into the meal or flour state a fair portion of the marvelous sustaining and nourishing powers which make the banana the king among fruits. The improvements which this century has seen, that lead up from the crude mandioca meal of the Brazilian native to the beautiful pearl tapioca of commerce, have developed for the cassava, *Manihot utilissima*, a foreign consumption which now runs high into the millions of dollars annually. The same period has seen the crude black cacao of the Caribees and northern South America develop into the chocolate, breakfast cocoa and broma of to-day, and now the tree *Theobroma cacao* vies with coffee in yielding nourishment and producing wealth in many countries. So may it be with the banana, if inventive skill will but turn its attention in that direction.

Sounds Focused by Ships' Sails.

The widespread sails of a ship, when rendered concave by a gentle breeze, are most excellent conductors of sound. The celebrated Dr. Arnott relates the following circumstance as a practical proof of this assertion: A ship was once sailing along the coast of Brazil, far out of sight of land. Suddenly several of the crew, while walking along the deck, noticed that when passing and repassing a particular spot they always heard with great distinctness the sound of bells chiming sweet music, as though being rung but a short distance away. Dumfounded by this phenomenon, they quickly communicated the discovery to their mates, but none of them were able to solve the enigma as to the origin of these seemingly mysterious sounds. Several months afterward, upon returning to Brazil, some of the listeners determined to satisfy their curiosity. Accordingly, they mentioned the circumstance to their friends, and were informed that at the time when the sounds were heard, the bells in the cathedral of San Salvador, on the coast, had been ringing to celebrate a feast held in honor of one of the saints. Their sound, wonderful to relate, favored by a gentle, steady breeze, had traveled a distance of upward of 100 miles over the smooth water, and had been brought to a focus by the sails at the particular locality in which the sweet sounds were first heard. This is but one of several instances of a similar kind, trustworthy authorities claiming that it has often happened under somewhat similar circumstances.

Memory as a Test of Age.

Memory is often a good test of age. When a person begins to find the recollection of current and recent work failing, and when he finds the recollection of events of the early part of his life acutely perceptible, and by a kind of spontaneity recurrent, the evidence is certain that the mind of that person is aging. The fact is still further emphasized if, with the remembrance of past days, there is a sympathetic response calling forth a sentimental feeling either of pleasure or of pain. There probably is a physiological reason for these phenomena. In early life certain centers of the brain are filled with impressions and images which have become fixed, and for a time quiescent. They sleep. While they sleep other parts of the brain are charged with new impressions, which remain in activity, provoking the physical body into new and continued actions, and constituting the life of the individual as it is seen at work, nay, as it really is. But time goes on, and under the active life the brain centers receiving the later impressions tire, wear out, and for working purposes suspend function and die. Their suspension is not, however, the suspension of the whole of the cerebral organism. The parts first impressed and imprinted—the parts that carry the latent impressions—remain intact, and no longer oppressed and obscured by that which has accumulated upon them, begin once more to live and display their activities. So aged people who forget the names of those who are staring them in the face, who forget the details of the last ride, or walk, or work, and who forget engagements, letters, and hours of meals, remember with the freshness of youth the friends of their youth; the places, habits, conversations, events that have long since passed, and have been so long in oblivion.

The study of memory in relation to age is full of practical as well as of philosophical importance. It bears on the value of evidence of observed facts and phenomena at different stages of life. There are thousands of persons who could give no evidence worthy of credence respecting sayings and events of to-day, who could still give the most accurate and reliable evidence about sayings and events of fifty years ago; and, if sympathies change with memories, there is an explanation, clear enough, why with age likes and dislikes should undergo the astonishing modifications we so often witness. I was called once to see a dying man who was advanced in life. He was muttering something strangely.

"What is it he says?" I asked. "I do not know, sir," replied the nurse, "but it's all about Monday, and see how curiously he moves his hands." I listened attentively, and soon caught the words, repeated many times: "Oh Jesu, Agnus Dei, qui tollis peccati mundi. Miserere nobis." I observed thereupon to my medical brother, whom I had been called to meet in consultation, "He," the patient, "is saying part of a Romish litany. He is a Roman Catholic." "Impossible! I have known him for thirty years, and he has been a man of the freest thought, good in every way, but allied to no creed whatever, and opposed to the Roman Catholic faith." "That may be, but in his early life, I warrant you, he was brought up in that faith and learned its services." On inquiry my conjectures proved correct. In the first five years of life he was trained in the Catholic ceremonial, since which age he had come under influences that had changed the whole tenor of his thoughts.

The point I wish to make in concluding this opusculum is, in the strictest sense, practical and medical. Whenever a patient who has passed the fifties, or is fairly into them, reports that current memory is fading and past memory is reviving, and when he reports also that his sympathies are running with his memories, his current sympathies declining, his old ones reawakening, he is in an indifferent condition. He requires immediate mental rest of those faculties that are becoming impaired, and is in want of pursuits and scenes that will bring new faculties into play. Fortunately we never use up a tithe of our brain surface. There is always ample uncharged surface to work upon even late in life, and if the brain be not physically diseased, new memories may be called forth which open up new activities and cover in the old. William Harvey, in his latter days, took to mathematics, and for the first time followed them with ease, much to his quiet. I knew an aged man who took, under the same circumstances, to music, and became quite a fair violinist; from all of which comes a lesson—

In second childishness child life revive;
Learn something new each day, and so re-live.

—Dr. B. W. Richardson, in the Asclepiad.

THERE are 208,749 railroad bridges in the United States, spanning 3,213 miles.

Opening of the Great Leland Stanford, Jr., University.

The opening ceremonies of this great institution of learning took place at Palo Alto, Cal., on October 1. As an individual benefaction for useful purposes it is one of the noblest and most generous of any on record. The endowment reaches the munificent sum of twenty millions of dollars. On the day of the opening a stage had been arranged at the north end of the quadrangle, and the spot had been decorated with evergreens and palms, with a background of American flags artistically arranged. On the rear wall hung a portrait in oil of Leland Stanford, Jr., in whose memory the university was erected. Seats had been arranged on the stage for distinguished guests. The seats in front were reserved for the students, and on the right of the stage were raised seats for the choir. The great quadrangle was filled with people.

Every seat was taken and thousands were obliged to stand. The faculty of the Stanford University and professors from the universities at Berkeley and Santa Clara had seats upon the platform with other guests.

A little before noon the Senator and Mrs. Stanford ascended the platform, and as they came into view of the audience there was enthusiastic cheering, while the students for the first time expressed their college yell, "Wah hoo, wah hoo, L. S. J. U. Stanford."

After devotional exercises President David Starr Jordan, of the university, introduced Senator Stanford, who was greeted with prolonged applause. Senator Stanford spoke at length, reviewing the progress of education and the founding of this university.

He was followed with addresses by Judges James McMillan Shafter, one of the trustees of the university, Martin Kellogg, President of the University of California, and President Jordan.

Four hundred and forty students have been admitted to the various classes of the university, of whom ninety-five are girls. The dormitories, as far as completed, will not accommodate more than 300 pupils, but as some of the boys have consented to share their quarters with others, 350 pupils can be accommodated. At present the others will find lodgings in the neighborhood. Fully 1,100 applications for admission to the institution have been received, and examinations are not yet finished.

Seven years ago Senator Leland Stanford lost by death his only son Leland Stanford, Jr. The university is erected as a memorial of the dead beloved. We take the following particulars from the New York *Tribune:*

The Leland Stanford, Jr., University has probably excited more interest in this country than any institution since the founding of Cornell University, over twenty years ago. It is one of those experiments in education which appeal to the popular imagination just as Cornell appealed to it, because it is an effort to strike out in a new field. The university has a princely endowment; it is the chief object in life of Senator Stanford, who has never yet turned back in any work which he undertook to carry to completion; it represents the thought and study of a singularly practical and broad-minded man for twenty years; it is the means by which he hopes to make his great fortune of direct benefit to the youth of California who have the ambition to take advantage of the manifold opportunities offered in this new Western land.

In founding the university and endowing it as few institutions in this country are endowed, Senator Stanford has had in view mainly the large class of boys and girls who desire to make their own way in life the moment they come out of school. While the higher education will not be neglected, the greatest attention will be given to those special studies that will enable pupils to do something for their own support as soon as they are graduated. For this purpose the schools in mechanic arts, in manual trainings and in all the sciences will be made the most perfect in the country. The collections already secured in botany, mineralogy and geology are among the most valuable in the world, and in other sciences collections and apparatus will be equally perfect in time. With a faculty thoroughly in earnest, good results ought to be accomplished in original work

The project of a university at Palo Alto, in the very heart of the rich Santa Clara Valley, was taken up by Senator Stanford as a distraction in the great grief of his life. He had made an imperial fortune by building the overland railroad in the face of public doubt and distrust; he was preparing to train his son to assume much of the burden of the care and responsibility that great wealth brings with it, when Roman fever cut short the young man's career. The lad had always shown the keenest interest in mechanics, and what was stranger still, though only seventeen at the time of his death, he had developed a plan for a great museum on this coast which should be free to the people and should be used to aid boys who were learning trades. He amused himself collecting curiosities and specimens of art work in many materials for this museum during the last few months he spent in Italy. When death ended this young life, so full of promise, the parents were naturally inconsolable. Even their great wealth seemed to add to the irony of fate, for of what purpose was it, since they had no one to inherit and use it wisely? It was while plunged in this first grief that the thought came to Stanford to put into practice the plans of his son and to make them bear directly upon the class of young people with whom the son had had the deepest sympathy. This idea made so profound an impression on him that it seemed like a vision from the other world, like a direct message from the dead. He threw off the lethargy of grief, and since that time he has devoted much of his time and energy to the development of his great educational scheme.

A special act was passed by the California legislature permitting the conveyance to trustees of property for the endowment of an educational institution. A board of trustees was appointed, of which Judge Lorenzo Sawyer, who died recently, was chairman, and which included such representative men as Justice Stephen J. Field, Senator Stewart, Judge Deady, of Oregon; Judge James McM. Shafter and Irving M. Scott, the builder of the cruisers Charleston and San Francisco. To these trustees, Senator Stanford and his wife conveyed by deed the fine estate of Palo Alto, comprising 7,300 acres, the Vina ranch in Tehama County of 55,000 acres, which includes the largest vineyard in the world; the Gridley ranch in Butte County of 21,000 acres, and other valuable property. The total endowment is above $15,000,000, and the revenue from the various properties is large. It was decided to erect the university buildings not far from the Senator's residence on the Palo Alto ranch. The site selected is about three miles from Menlo Park, the most beautiful of the collection of suburban homes of San Francisco millionaires. The site is an almost level bit of land just at the edge of the foothills on the east side of the rich Santa Clara Valley. It is the ideal place for a seat of learning, as it is removed about three miles from the railroad, and is in a district that is sheltered from winds, and is especially suited to the growth of all trees and shrubs. One hundred acres were set apart for the university grounds.

The architecture of the buildings is as unique as the plan of the university. The prevailing style is an adaptation of the California missions, low buildings, with heavy walls and roofs of tile. The main group of fourteen buildings incloses a quadrangle 600 feet long by 250 feet wide. These buildings are mainly intended as class rooms. They are built of cream-colored sandstone, are 70 by 50 feet and the height from the ground to the roof tree is 60 feet. All the buildings open upon an arcade, with Moorish columns, which is 20 feet wide and 18 feet high. This runs around the whole quadrangle and permits one to walk in comfort even during very rainy weather.

The surface of the quadrangle is covered with a heavy coat of asphaltum pavement and the levels are so nicely adjusted that all water is drained off in a few minutes. Eight circular beds in this quadrangle are filled with semi-tropical trees and plants, which add greatly to the beauty of the scene. Midway on one side of the quadrangle is the main entrance, over which will be erected an imposing arch; on the opposite side is the museum building, four stories high, of pure Greek architecture. On the west side of the quadrangle will be built the memorial church, cruciform in shape and built of the same materials as the other structures. Even in its present unfinished condition this quadrangle is worth traveling many miles to see. The perfect line of the arches in the arcade is something to which no words can do justice. Standing inside the quadrangle and looking out through any of the arches between the buildings, one has glimpses of deep green fields and of trees whose foliage is lightly touched by the afternoon wind. One seems to be looking out upon one of the hills of the Alhambra, and this old world air is strengthened by the mellow tone of the stonework and the tropical luxuriance of the fan palms. Photographs at best give only a faint idea of the charm of this arcade, which fills and satisfies the eye.

When one steps out of the arcade, he is at once brought back to the present by the spectacle on one side of the two large dormitory buildings and on the other of the tall stone chimneys, the boiler house and machine shops. The boys' dormitory is built of sandstone, but the building for the girls is made of concrete. The boys' building is probably the finest structure of the kind on this coast. No expense was spared on it; everything is genuine, even to the brass in the gutters that carry the water from the roof. Over $400,000 was spent on it, but it is a thing of beauty in its finish. The main dining hall is the handsomest room in the building, and no hotel in New York has a finer apartment, so far as harmony of tones, light and outlook are concerned. The building is finished throughout in hard woods, and though the furniture is plain, it is very handsome. Senator Stanford's idea is to have nothing that savors of luxury. On the same principle, the board furnished will be good but simple. Those who may come to the university under the idea that every modern luxury will be furnished because the institution has a great endowment will be disappointed, as will those who fancy they can get along without solid work. Mrs. Stanford has provided each room in the dormitory building with a handsomely bound Bible—a reminder that though the university is not bound to any creed, it is to be Christian in spirit, and religion will form a vital part of all instruction.

The girls' dormitory building has been built of concrete which harmonizes in color with the stone of the quadrangle near by. It was found necessary to use this artificial stone in order to complete the building for the opening. The museum, a huge four story building of perfect classical style, has been built within four months. The material is concrete, and it is said to be the largest building in the word made of this artificial stone. An enormous force of men has been at work on this building, and though it is practically finished, yet it will not be feasible to place the collections in the various rooms, lest they be injured by the damp walls. In this climate a building of concrete, rushed to completion, requires several months for the walls to become thoroughly dried. Senator and Mrs. Stanford have gathered a large number of rare and valuable articles for this museum. The nucleus of it is the collection by young Leland Stanford when in Italy. To this will be added the finest collection of copies of the old masters ever brought to this country, with an admirable representation of copies of the masterpieces of modern European art.

Near the dormitory buildings are the cottages of the faculty. These are so arranged that additions may be made to the group at any time, and it is expected that by another year the majority of the professors will be domiciled there, as well as many families of those who have children in the university. It is needless to point out what a center of refined society will be formed at Palo Alto, should the present plans be carried out. No place of residence in California has greater advantages in the way of climate, scenery and the advantages of proximity to the largest city on the coast, and none will have a society more congenial to cultured people. It is among Senator Stanford's designs to build a large number of cottages near the professors' quadrangle for the accommodation of those who may desire to make partial use of the university collections or to place their children in any of the schools. No arrangements have been made for preparatory training, but already two young women, one from Wellesley and the other from the Harvard Annex, have opened a preparatory school for girls in the old Coon mansion on the university grounds, and about a mile from the quadrangle. These young ladies propose to take a post-graduate course and to pay their expenses by this school.

The applications for admission have already outrun the accommodations. Over 400 boys have applied. Sixty-two girls have been assigned rooms in the girls' dormitory. Thirty-seven are from California, two from Honolulu, and the remainder from Coast States and the East. Besides these, forty pupils will come up every day from San Jose, returning in the evening. Senator Stanford has kindly arranged to give these students a ten-cent fare for the round trip, so that their traveling expenses will be light. Many students have been attracted from Eastern colleges. Professor Swayne brings fifteen of his class from the University of Indiana, and Professor Gale, of St. Louis, is also expected to fetch a number of his special students.

Much of the success of the final arrangements is due to the great executive capacity and energy of Dr. David Starr Jordan, the president. President Jordan is known to all Western teachers as the man who has made the University of Indiana what it is to-day. He is a graduate of the Scientific Course of Cornell University, and has won higher honors in the scientific world than perhaps any other graduate of that university. He stands at the head of American ichthyologists, but he is not merely a scientific specialist. He is a man of the broadest culture. He has much of ex-President Andrew D. White's faculty of stimulating students to study and research, and he is full of that hearty human nature and sympathy which go so far to establish *esprit de corps* among any large body of students.

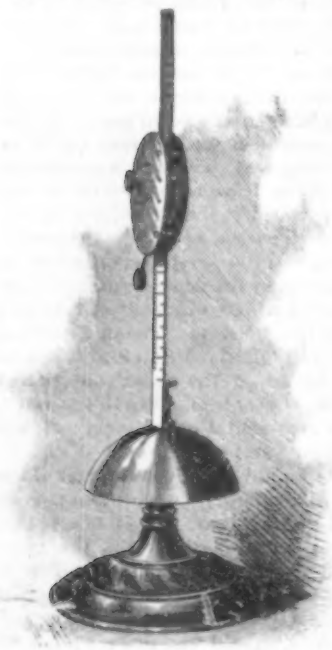
Concert Music by Telephone.

I once spent a large share of the night with a telephone operator at Worcester, and know that there are many pleasant things connected with the business. Generally after 12 o'clock the calls are few and far between, coming chiefly from the newspapers and doctors. It is the custom of some of the operators to make the circuit of several places and tell funny stories.

The pleasantest part of it is when Worcester, Fall River, Boston, Springfield, Providence and New York are connected by the long distance wire. Most of the boys of these places are musicians. The operator in Providence plays the banjo, the Worcester operator a harmonica, and generally the others sing. Some tune will be started by the players and the others will sing. To appreciate the effect, one must have a transmitter close to his ear. The music will sound as clear as though it were in the same room. It is a very hard thing for a person to believe unless he has heard it.—*Boston Evening Record.*

A GRAVITY-OPERATED TIME ALARM.

The device shown in the accompanying illustration contains no actuating springs, but depends solely for its operation on the descent by gravity of the casing on the post on which it is held. The post has on its front a graduation indicating hours and minutes and subdivisions, and on one edge of the post are rack teeth terminating some distance above a gong or bell. In a frame or casing fitted to slide vertically on the post a transverse shaft is mounted to turn and slide, the shaft projecting beyond the front plate, where it is provided with a button. On this shaft is a pinion meshing with the rack teeth of the post, from which the pinion is disengaged by pressing the button to slide the shaft inward, a spring normally pressing the shaft outward, so that the pinion will be in mesh with the rack teeth. The shaft also carries a gear wheel meshing with a pinion on another shaft, to which is secured an escapement wheel, adapted to be acted on by an ordinary escapement secured on a shaft rocking in suitable bearings. The escapement shaft is connected with a pendulum extending through the bottom of the casing. To set the alarm, the button on the front of the casing is pressed inward, to disengage the pinion on the main shaft from the rack teeth of the post, and the casing is raised the desired distance, as indicated by the graduation, to allow for the time which must elapse before the alarm is to be sounded. When pressure is removed from the button the pinion engages the rack teeth, and, the pendulum being started, the casing commences to move down the post by its own weight, the movement, however, being gradual, on account of the action of the pendulum and the escapement. The moment the pinion on the main shaft leaves the last tooth of the post the casing drops upon one end of a striker, causing the gong to be sounded. This alarm is designed to be a very convenient one for photographers, chemists, dentists, school and music teachers, cooks, etc., as well as business men generally. It has been patented by Mr. S. E. Jones, room 8, No. 69 Dearborn Street, Chicago.



JONES' TIME ALARM.

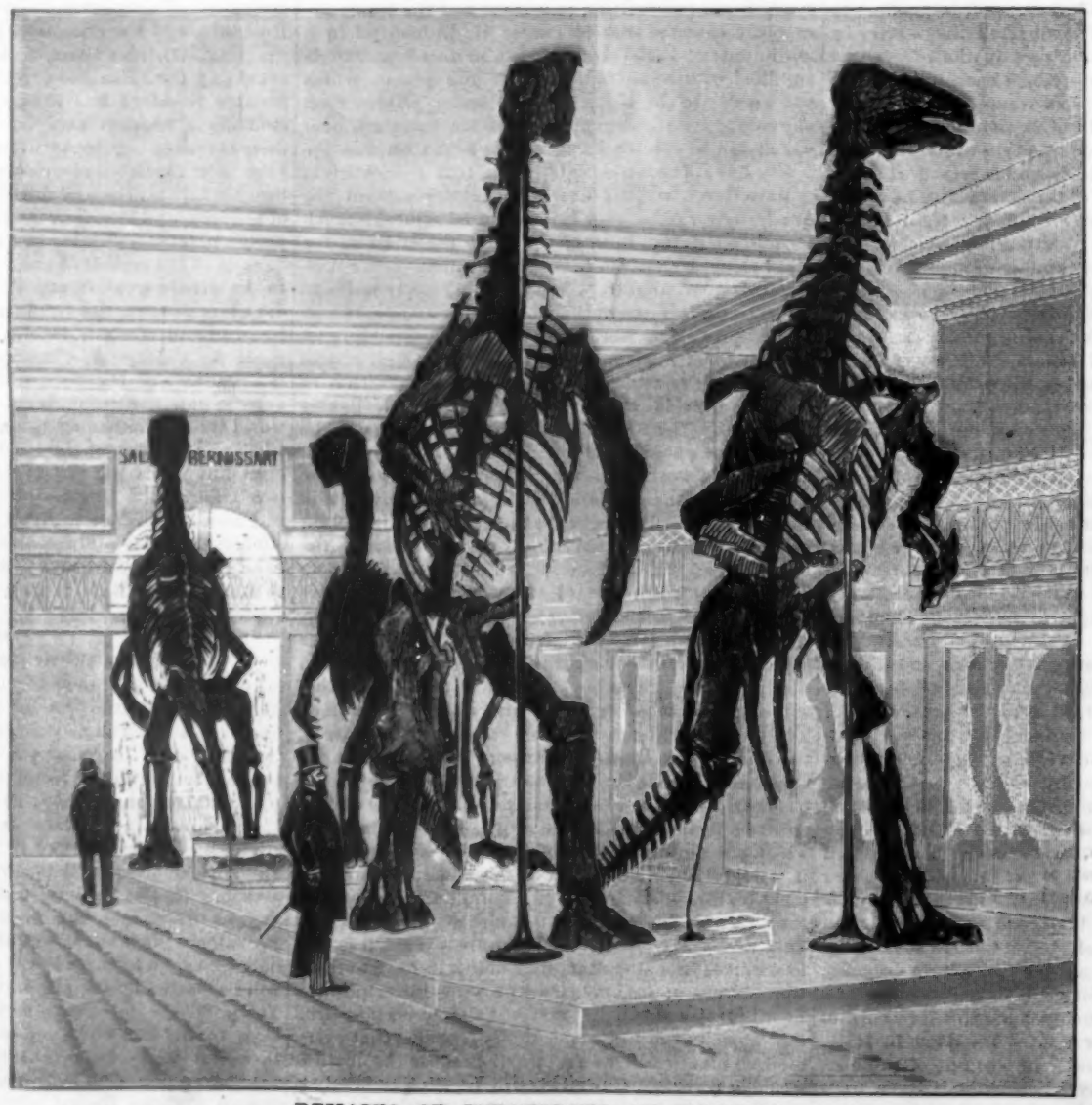
Twelve Years with Ensilage.

In 1880 I built a 300 ton stone silo, in two compartments, and afterward a smaller one of wood. As a result of my experience, have reached the following conclusions:

That stone, for a permanent silo, where the conditions are such that the cost is not excessive, is the more economical. That in a stone, cement-lined silo not a pound of ensilage need waste or deteriorate. That a covering of trash, closely packed deep enough to take up the mould, *i. e.*, as deep as the air penetrates, is better than weighting. I discontinued weighting years ago. That, be the time for growth long or short, Southern white is the best corn to plant, because of its quick growth and great productiveness. That, if cut at an early stage of growth, the ensilage is more acid, but is relished by cattle, and is excellent food. That the best period for cutting is the roasting ear stage. Last year much of my corn stood until the kernel shrank and hardened, with the result that a large proportion of the kernels were voided whole, and, reasoning from analogy, I think it a fair inference that the stalk is less digestible after hardening than when in its more succulent state. That the best distances for planting are about four feet apart for the rows, and one foot for kernels in the row. This will give full-sized stalks and ears. Many of the ears stand nine feet from the ground where I am now cutting. That it is dangerous to feed finely-cut cornstalks, whether dry-cured or ensiloed, to horses or mules.—*A. J. Coe, in the Country Gentleman.*

THE IGUANODONS AT BRUSSELS.

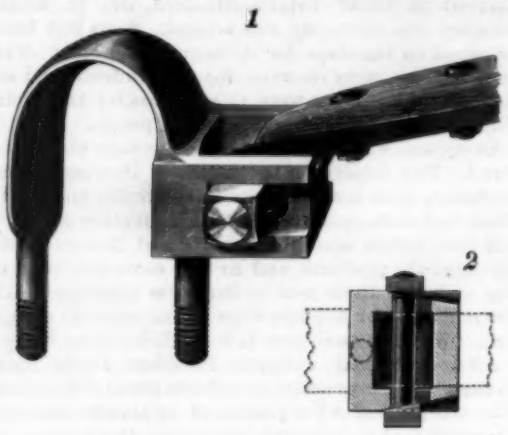
In the year 1878 the miners employed at the Bernissart Colliery, Belgium, while engaged in a gallery some three hundred yards below the surface, came upon an immense chasm containing a quantity of bones. Some large teeth were forwarded to a professor in Louvain University, who presently pronounced them to be the teeth of the iguanodon, a gigantic extinct reptile, whose remains had up to that time been rarely discovered. One of the few previous finds of the kind was made in the year 1830 in our own county of Sussex. On that occasion Cuvier, the celebrated naturalist, pronounced that the specimens sent him appertained to the iguanodon tribe. Perceiving the importance of the Bernissart discovery, the Belgian government took the matter up, and excavations were vigorously prosecuted, with the result that upward of 100 tons of bones were sent to Brussels, in twenty-two wagons. To protect them from perishing from exposure to the air, the bones—which had been carefully numbered according to the position where they were found—were coated with plaster and wrapped in cloth. When this covering was removed the bones were dipped in boiling gelatine, which restored their original firmness, and then—twelve years being consumed in the operations—the five skeletons exhibited in the Natural History Museum at Brussels were laboriously built up out of these fragments. As our engraving shows, the iguanodons were creatures of great size and of a kangaroo-like appearance, from their habit of standing on their hind legs. It is supposed that their tails, which were very thick and heavy, acted as a balance, enabling them to maintain this upright position. Their diet consisted of vegetables, fish, and insects. Their remains were found buried in an alluvial deposit left by the periodical river floods. We abridge the above from a very interesting paper in the *Independance Belge*, by M. Hector Chainaye. Our engraving is from a drawing by M. Cassiers.—*The Graphic.*



REMAINS OF IGUANODONS AT BRUSSELS.

AN IMPROVED COUPLING.

The extremely simple form of thill coupling shown in perspective and in horizontal section in the accompanying illustration is anti-rattling, and has neither springs nor washers; the coupling may also be advantageously employed with pump rod connections,



SMITH'S THILL COUPLING.

and for many similar purposes where simple, efficient, and noiseless connections are desirable. It has been patented by Mr. Marcellus T. Smith, of Northport, N. Y. The thill iron has a circular rear end and a circular eye, the iron fitting a semicircular socket open at the top and for a portion of its bottom, the usual form of clip being made integral with or attached to the rear surface of the socket. The front wall of the socket has a beveled shoulder on its inner face on which the thill iron rests when in normal position, and in one of the outer side walls of the socket is a semicircular recess tapering outward toward the front, the deepest portion of the recess being at the front end of the socket. An aligning recess is formed in the other outer side wall of the socket, the other recess being square in cross section, and both of them forming grooves or channels, through which, near their shallow ends, are elongated openings through which is passed the coupling pin, of a diameter to snugly fit the eye of the thill iron. The inner face of one head of the pin is square in section and beveled to fit the inclination of the square channel in one of the outer sides of the socket, as shown in Fig. 2, the opposite threaded end of the pin receiving a nut whose inner face is convexed to fit the circular groove or channel in the other outer side of the socket. When the thill iron is placed in the socket and the nut is screwed well up to place in the circular channel, the eye of the thill iron is carried to a firm, positive, and non-rattling engagement with the wall of the socket chamber, and should the nut in time become slightly loosened, from wear or otherwise, it can be readily tightened to bring the thill iron into position where it will not have the slightest lateral play.

Common Turpentine and Larch Turpentine.

If a few drops of common turpentine in a test tube are covered with 5 parts ammonia of specific gravity 0 96, the turpentine forms a milky emulsion and soon gelatinizes. Larch, otherwise known as Venice turpentine, remains apparently unaffected, but if constantly stirred up it becomes a solid, colorless mass.—*E. Hirschsohn.*

A DRIVING MECHANISM FOR VELOCIPEDES.

A mechanism designed to be readily applied to any form of velocipede, to impart a regular, positive and powerful motion from the pedal shaft to the axle of the driving wheels, is illustrated in the accompanying engraving. It has been patented by Messrs. Walter A. Evans and Thomas Cowan, of No. 367 Graham Street, Winnipeg, Canada. The driving mechanism, a vertical section of which is shown in the small view, is inclosed in a casing through the rear end of which the driving axle of the machine passes, while the pedal shaft is journaled in the forward end of the casing. A worm on the pedal shaft meshes with a worm wheel on a vertical shaft in the casing, the pedal shaft turning fifteen times to impart one revolution to the worm wheel. The motion is thence transmitted, by spur wheels and pinions, as shown in the sectional view, the speed being constantly increased, to a short shaft journaled in a bracket in the casing, and which carries a bevel gear meshing with a bevel pinion through which motion is transmitted, through a large spur gear, to a spur gear on the driving axle. The arrangement is such that the driving wheel will be turned about four and a half times, or practically so, for each revolution of the pedal shaft. A similar driving mechanism may, if desired, be employed in connection with mowers or binders, by placing the worm on the axle, when the drive wheels will act direct upon the worm wheel.

EVANS & COWAN'S VELOCIPEDE.

ONE KIND OF CAM.—*Concluded.*

BY A. D. PENTZ.

A machine to cut a cam of this character is a very simple one when made, but there are points in its construction that must be closely observed in the designing, and carefully watched in the building of it. Cams of this kind, if cut by the periphery of a cylindrical cutter, may do well with cutters of one particular size, but will fail with either smaller or larger cutters. In one shop where a great many of this kind of cam are made, it is found well to finish them to a former by a single pointed tool. This is good practice for quality, but needs too much tool sharpening and tool setting. In another shop the cylindrical cutter is used, but when the size of the cutter is materially reduced by resharpening, it is replaced. This is practical in that particular place, because the worn cutters may be used for other work after their sizes are so reduced that they no longer are fit to make good cams with on the machine. A fine engineer, now in Scotland, designed a machine to sequently change the centers of rotation in cutting this kind of cam, so that each arc is cut while the cam is being turned on the theoretical center of that arc. This machine worked finely, but it was necessarily elaborate in design, and had such precise points of construction that tool makers are scarce who are capable of getting all its points exactly correct. I have not seen a machine that can cut these cams of various sizes or of different centers of arc without special formers for each size and each shape.

While these cams are very useful, they heretofore have been not so difficult to cut as difficult to keep precise to sizes and to uniform diameters in the same cam. The difficulty has not been from neglect in not having competent engineers to design, but in overcoming the effect of differing sizes of cylindrical cutters cutting with thei. peripheries on an irregular rotating shape. As the cam turns from the smaller to the larger radius, a large cutter will meet the larger coming part sooner than a small one, and in descending the reverse of this is true. Of course these cams are generally mounted to rotate, while being cut, and arranged so that their mean centers are concentric to the spindles that carry them. But this, while it is a help, is but a partial cure at best.

Having given this problem some thought during my experience, I herewith submit a sketch of a machine that I believe will work, give accurate results, and produce more cams than any other method yet tried.

This machine, as sketched, indicates rather than designs many of the details; but the general plan is what is suggested. The details of construction would vary in each shop to harmonize with the practice of each shop.

Fig. 1.

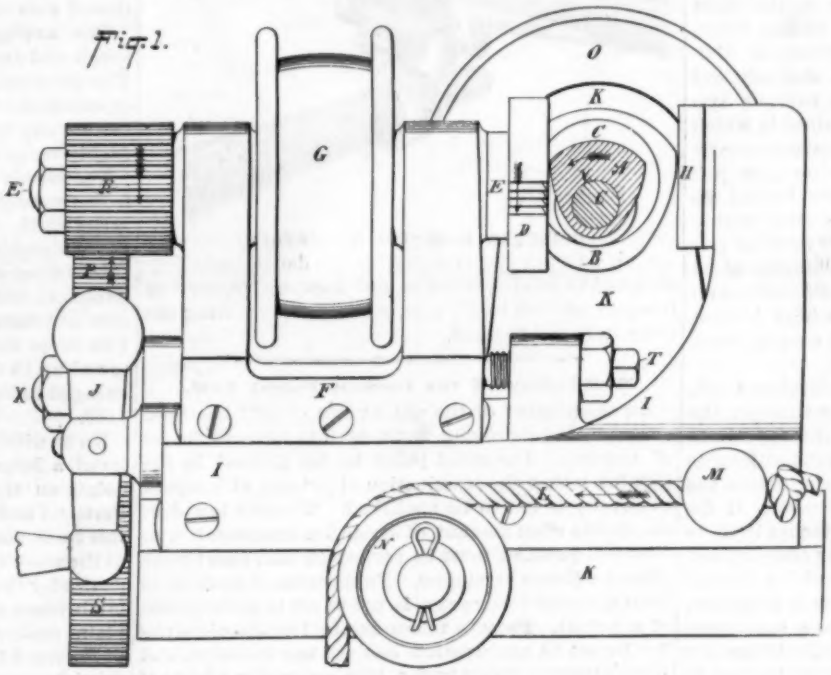
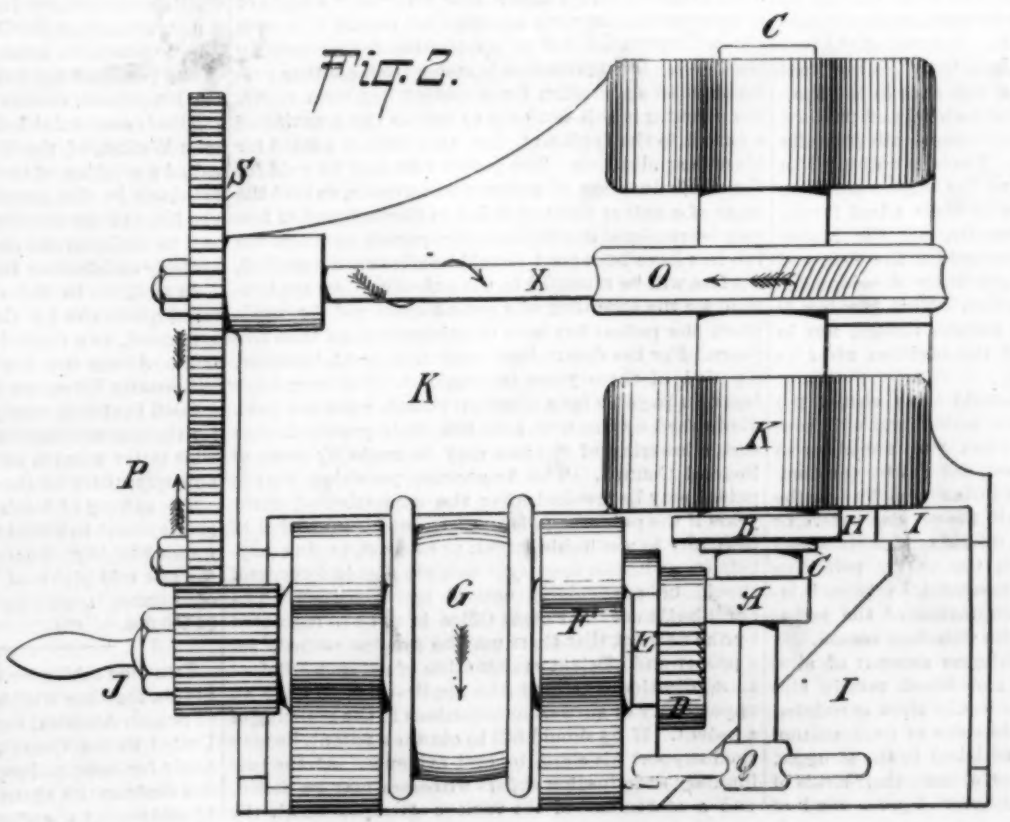


Fig. 2.



In the sketches, A is the cam in operation, mounted on the spindle, C. In Fig. 1, the cam and its arbor are cut in section to indicate their relative positions to the center, V, of the spindle, C. B is the former, from which the cam in operation takes its shape. D is the cutter, mounted on the spindle, E. This spindle must be exactly square with the spindle, C, and the centers of both these spindles must be cut by the same horizontal plane. The cutter, D, also must be exactly flat on its face, must be large enough to more than cover the width being cut, and have teeth on its periphery as well as its face. This cutter, thus arranged, will not cut a shoulder against a hub that is perfectly square, and as this is, I believe, never necessary, it matters not. F is the headstock, adjusted by the screw and handle, J, and located by the stop, T. G is the pulley that drives the whole machine positively. H is shoe on the carrier, I. This shoe is of hard steel, and the plane on H that is in contact with the former, B, must be exactly perpendicular, or square to the center of the spindle, E, in all directions. The former, B, should also be of hard steel, ground to shape. It will be well if there be an oil cup fastened to the frame, K, and situated so that this former will continually pass through the oil. The carrier, I, is attached to the frame, K, by a common slide device, and through it the shoe, H, is held to the former, B, by a weight suspended from the cord, L, which operates about the wheel, N, and is fastened to the stud, M. On the upper side of I is a slide, to which the headstock, F, is attached, so that the motions of I are all communicated to F, and thus the cutter, D, is always at the same distance from the shoe, H; and because its cutting face is parallel to the face of this shoe, H, it must, if the stop, T, be rightly set and the former be correct in shape, cut correct cams.

It will further be seen that the cutter, D, may be reduced by sharpening to any thickness, and the parallel effect with the face of H will not be impaired; and, further, that in adjustment, after sharpening the cutter, the only part to be moved will be the screw, T. By thus opposing the shoe, H, to the cutter, D, a much lighter weight is required to keep the contact against the former, B, than otherwise would be needed.

The cam is held to its place on the spindle, C, by the T-nut, Q, which fits a screw on the end of the arbor within the cam.

R is a pinion on the end of spindle, E. It engages the intermediate gear, P, and it is long enough on its teeth to permit the headstock, F, to be adjusted without affecting the engagement with this gear, P. The worm gear, O, rotates the spindle, C, being driven by a worm on the shaft, X. This shaft, X, is driven by the gear wheel, S, and connected to the spindle, E, by the intermediate, P, and the pinion, R.

Thus if the pulley, G, be driven by a belt, the cutter, D, will remove the metal on the cam, A, and the train of gears operated by the pinion, R, turns the shaft, X, and through the worm gear the spindle, C, which progressively brings the cam to be cut on the whole surface. The gears S and P are, by a mistake in drawing, made too thick in Fig. 1.

While this machine has never been made, my experience with the problem convinces me that it will fill the bill.

THE sun never sets on the soil of the United States. When it is 6 o'clock at Attoo Island, Alaska, it is 9:36 o'clock A. M. the next day on the eastern coast of Maine.

Degeneration and Evolution.

Mr. H. G. Wells, writing for the *Gentleman's Magazine* (London), says: Perhaps no scientific teaching has been exposed to a greater amount of popular misconception than the doctrine of evolution. In the popular conception, life began with the amœba, then came jelly fish, shell fish, and a miscellaneous mass of invertebrates; then real fishes and amphibia, reptiles, birds, mammals, and man, the last and first of creation. This is not the teaching of science. On the contrary, biology, along with advance, teaches retrogression as its essential complement. Isolated cases of degeneration have long been known. It is only recently that the enormous importance of degeneration as a plastic process in nature has been suspected and its entire parity with evolution recognized. In fact, the path of life so frequently compared to a steady ascent, an indication of an inevitable tendency to higher and better things, is distinctly repudiated by scientific observers. The sounder view is that living species have varied along divergent lines from intermediate forms and by no means necessarily in an upward direction.

The best known and perhaps the most graphic and typical illustration of the downward course is to be found in the division of the Tunicata. The untrained observer would probably class it near the oyster and the mussel, and a superficial study of its anatomy might even strengthen this opinion. As a matter of fact, however, these creatures are far more closely related to the vertebrata, a fact exhibited in the details of their development. It is a matter of common knowledge that living creatures in the course of their embryonic development repeat, in a more or less blurred and abbreviated series, their generalized pedigree. For instance the developing chick or rabbit passes through a fish-like stage, and the human fœtus wears an undeniable tail. In the case of these ascidians (the Tunicata) the fertilized egg cell destined to become a fresh individual follows an entirely different course from that pursued by the mollusks, the dividing and growing ovum exhibits phases resembling in the most remarkable way those of the lowliest among fishes, the lancelot, or amphioxus. The method of division, the formation of the primitive stomach and body cavity, and the origin of the nervous system are identical, and a stage is attained in which the young organism displays—or simulates—vertebrate characteristics. It has a notochord, or primary skeletal axis, it displays gill slits behind its mouth, as do all vertebrated animals in their earlier stages, and the origin and position of its nervous axis is essentially vertebrate. In these three independent series of structures the young ascidian differs from all invertebrate animals, and manifests its high descent from the vertebrates. It is an evident case of retrogression.

Like a tadpole, this animal has a well developed tail, with which it propels itself vigorously through the water; it has serviceable sense organs, and appears in this, its earlier stages, to be full of vigorous, enjoyable life; but scarcely is this stage attained before the animal undergoes a process of retrogression. It develops suckers, by means of which it attaches itself to the rocks, its tail is absorbed, eye and ear atrophy, and the skin secretes the coarse inorganic-looking "test;" the transient glimpse of vivid animal life is forgotten, and the creature settles down for life to a mere vegetable existence. In some cases the degradation has been a strategic retrogression—the type "stoops to conquer." This is, perhaps, most manifest in the case of the higher vertebrate animals. It is one of the best known embryological facts that a bird or a mammal starts in its development as if a fish were in the making, and that later the organs get twisted and patched to fit a life cut of water—nowhere organs built specially for this very special condition. There is nothing like this in the case of a fish. There the organs are from the first recognizable sketches of their adult forms, and they develop straightforwardly, but the higher types go a considerable distance toward the fish, and then turn round and complete their development in an entirely opposite direction. This turning is evidently precisely similar in nature, though not in effect, to the retrogression of the ascidian after its pisciform or larval stage.

If a zoological investigator could have visited the earth during the upper Silurian period, and with prophetic eye could have singled out the ancestors of man, he would have found them, not among the dominant placoid fishes of the Silurian sea, but in the *Dipnoi* or mud fish, swimming in the pluvial waters, or inert and caked over by the torrid mud. He would have found in conjunction with the purely primitive skull, axial skeleton, and fin possessed by these Silurian mud fish a remarkable adaptation of the swimming bladder to the needs of the waterless season. It would have undergone the minimum amount of alteration to render it a lung, and blood vessels and other points of the anatomy would show correlated changes. Here we have the old story of degeneration over again; the mud fish had failed in the struggle, they were less active and powerful than their rivals of the sea, and they had taken the second great road of preservation—flight. Just as the ascidian has retired from an open sea, too crowded and full of danger to make life worth the trouble, so, in the older epoch, did the mud fish. They preferred dirt, discomfort and survival to a gallant fight and death. Very properly, then, they would be classed in our zoologist's scheme as a degenerate group. But some of them have risen in the world again; they came out of the rivers, gave birth to the amphibia of the coal, which gave place presently to the central group of reptiles, from which sprang divergently birds and mammals, and finally the last of the mud fish family, man—the heir of all the ages.

AN IMPROVED NECK YOKE.

The yoke center for connecting the neck yoke with the pole of a vehicle, as shown in the accompanying illustration, has been patented by Messrs. David H. Gotshall and Herbert Petit, of No. 507 Second Street, Astoria, Oregon. The yoke is of the usual construction, and in elbow lugs attached by bolts to its under side are journaled the trunnions of a circular plate having a depending flange, which extends around all the front side of the plate, and is doubled under at right angles to receive the head of a pole ring. The head may be readily slipped into a recess of the plate, and a neck between the body of the ring and the head comes opposite the bent portion of the flange, so that the ring may have all necessary movement. The ring is prevented from accidental removal by a pin extending through the plate and into the head of the ring, but there will be little strain on the pin, the lateral strain from the flat head coming on the flange of the plate. The ring is lined with leather or other suitable material to prevent wear and rattling. This yoke center is

GOTSHALL & PETIT'S NECK YOKE.

designed to be safe, durable, and inexpensive, moving freely in relation to the pole, while not permitting the yoke to pound thereon.

Modification of the German Patent Law.

An amendment of the patent law of 1877 has been passed by the Reichstag, and went into force on the 1st of October. The chief point to be noticed in the new law is that the examination of patents with regard to novelty is not to be abolished. The new law does not decide what amount of invention is patentable, so that this question must be settled in each case by the Patent Office as heretofore. Publication, if made more than a hundred years ago, is not to act in anticipation of a patent. Patents taken out in foreign countries are to act in anticipation against the inventor, and those claiming rights under him, only after a lapse of three months, and thus an extended period of time is allowed by the act for an application for a patent in Germany. If an invention is stolen from another person, and an application for a patent has been made, the inventor is able not only to oppose the granting of a patent to the applicant, but to obtain a patent for his own application. The patent fees may be paid for the whole duration of a patent in advance, so that the lapse of a patent through delay in the payment of fees may be rendered impossible. If a patent on which the full fees have been paid should be afterward annulled, the fees will be returned to the patentee. An application for the annulling of a patent shall not be made when the patent has been in existence more than five years. For the determination of this point, however, a period of three years is provided. The very high fees now payable for a German patent have not been diminished by the new act, but it is provided that such a lowering of the fees may be made by order of Federal Council. The important provision that a patent may be revoked after the expiration of three years if the patentee fails to carry out his invention in Germany to a suitable extent, or at least to do everything that he can to carry it out, remains in force, and should be particularly noticed by foreigners. The organization of the Patent Office is to be so regulated by the new act that there may be greater security for a proper and efficient examination of patents. Before an application is refused, the applicant is to have an opportunity of answering objections to the granting of a patent. If he should fail to obtain a patent, he may then support his claim by oral evidence. At the preliminary examination expert witnesses may be called, and a statement of the various attempts which the inventor had made may be presented. If the decision of a judge puts a new aspect on the case, the applicant is to have an opportunity of answering any objection raised. A proviso which is of great importance to chemical industries is that where proceedings are taken to patent a new material, every material of similar manufacture is regarded as included in the claim until proof to the contrary is shown. The damages payable for the infringement of a patent have been increased. The Patent Office, Berlin, was established at its new building in April last. This new office is in every respect suitable for its purpose, whereas the old one was too small. The public obtain a great advantage from the new arrangement, since the important technical library is now open to all persons from 9 A. M. to 9 P. M.

Lumber at Portland, Oregon.

The *Oregonian*, in speaking about the lumbering interests of Portland and vicinity, says: The principal forest tree indigenous to Oregon soil is the fir. For heavy frame work of all wooden structures, for bridge timbers, and even for boat building, the fir is the best timber in the world. It has all the tenacity of fiber of the best oak, without the propensity to split of the latter, and its lasting properties, when exposed to all the severity of weather, are not equaled by any other available timber in the world. It has been found by actual experiment that a piece of fir timber, when submitted to a heavy strain, did not break as soon as a piece of well seasoned oak of the same dimensions. It is only within the last five years that the Union Pacific, one of the greatest of the transcontinental lines, became convinced that fir was the safest, most economical, and strongest timber for wooden bridges that could be obtained in the United States, and Portland-cut fir is now regularly shipped by this company as far east as Omaha, for use in their new reconstructed bridges. Large quantities of this same wood are now used by this company in the construction of cars for their line.

The average price at the Portland mills, for both rough and dressed lumber, is about $14 per 1,000 feet. This price may vary a little at times, but long years of experience in this line has convinced the mill men of this city that lumber cut here cannot be sold profitably on an average for less than these figures.

The supply of logs for the local mills is now obtained from the banks of the Columbia River and its tributaries north of Portland. Along the banks of the upper Willamette there is a supply of good timber, but this timber cannot reach Portland, owing to the obstructions to floating rafts in the falls of the Willamette, at Oregon City, twelve miles north of Portland. The large rafts of logs from the Columbia are now towed up to the Portland mills by steamers regularly engaged in this traffic, at the rate of about 75 cents per 1,000.

Up to within a year past the Portland sawmills enjoyed a large and steady sale of their product to all points on the Union and Northern Pacific between Portland and the Missouri River. Last season most of this trade was cut off from the Portland mills, owing to the scarcity of cars furnished by the railroad companies for the transportation of this lumber East. The lumbermen of Portland have a great cause for complaint against the transcontinental lines of roads out of Portland the present season, in the matter of discriminating freight rates on lumber in favor of the South, as against Portland. A delegation of the Portland lumbermen, headed by Mr. H. R. Duniway, one of the youngest but brightest men in this business in the Northwest, recently went East with a view of laying their complaint before the traffic managers. Chairman Walker, of the Western Traffic Association, has called a meeting of the traffic managers of the different railroads in the association for this month, and it is the hope of the lumbermen of Portland that new rates will be made on the shipment of lumber which will be entirely satisfactory to the Portland mills.

In addition to the cutting of fir, cedar is sawed in small quantities by the local mills, and oak and ash are sawed, to a limited extent, by small mills in Portland. Along the low lands of the Columbia and Willamette Rivers are immense forests of cottonwood, a wood that is specially valuable for box making and for the manufacture of wood pulp for paper making. This latter wood is now sent to Portland in considerable quantities for the purposes above named.

The sawing of lumber in Portland furnishes steady employment to about 800 men, and yearly pays out in wages $600,000. There is about $1,900,000 invested in the saw mill plants of Portland, and the yearly sales of lumbe. made by these mills will approximate $2,500,000.

THE tide tables for the Atlantic Coast of the United States, together with 206 stations on the Atlantic Coast of British America, for the year 1892, published by the United States Coast and Goedetic Survey, are now ready for issue, and copies can be obtained for twenty-five cents at the agencies of the survey in this city, or by addressing the office at Washington.

Thought.

We do not fully understand or at least are not agreed as to the nature or character of normal mentality. Two or three generations ago it was believed to consist in the activity of a soul or spirit, which was enthroned somewhere in the brain. No explanation of the *modus operandi* of such activity eventuating in thought, as independent of the body, was apparently ever deemed necessary, or considered as a legitimate scientific inquiry.

In more recent times, and especially since the microscope has revealed to us the wonderfully complex and highly organized texture of the brain; and modern physiological research has made known more perfectly the functions of many parts and organs of it, the old theory has been rejected, and a leap has been made to the other extreme. A theory has been accepted by some to the effect that the whole thought process consists simply in the molecular activity of this highly organized cell-structure of brain. The hypothesis that a soul or any special entity exists within the brain or elsewhere in the body is a snare and a delusion and without proof. As a working theory for elucidating the phenomena of mind it is worse than useless. Perceptions, memory, reason, judgment, all consist of mere movements or vibrations of different kinds or degrees of multitudinous nerve fibrils and cells, which are composed of matter in its most highly organized form. Attention and will are only different forms of this same activity of nerve tissue as it becomes affected through external or internal impressions, while under the influence of the blood. In the words of one of its most vigorous advocates, "that which thinks, reasons, wills; that which is consciousness in phenomenon—is the brain; not any suppositious entity, of the existence of which we have no evidence whatever, and of the need of which as an hypothesis he is not conscious."

On the other hand, however, there are some who still feel conscious of the need of an additional element in any hypothesis which is assumed as a working basis for elucidating the physiology of the thought process. They are unable to accept mere assertion for argument, and much less for demonstration. They freely admit the dependence of mind upon the brain and nervous system in its exhibitions, and that no such processes as memory, reason, attention, and will, can be perfected and projected to other minds except by the agency of the brain; also that these several activities of the mind are defective and imperfect, weak or strong, largely in proportion as the brain is in a normal or abnormal condition. They also admit that the hypothesis of molecular activity only has the merit of simplicity, and if true ought soon to place us on vantage ground in elucidating the physiology of mind. But, on the other hand, they cannot remain indifferent to the fact that any hypothesis, to be accepted as reasonable, must harmonize with and cover the phenomena to be explained. Now, does molecular activity, or the vibration of cells and fibrils upon each other, present any resemblance to thought? Such vibration presupposes and consists simply in movement. This movement may occur with the inconceivable rapidity of light, but, after all, it is only movement, and if there results from or in connection with that movement of the anatomical elements of brain, something of a nature unlike motion, then it becomes necessary to add another element, which resides in the material affected by movement, to explain the phenomena presented. This element must be akin, in its nature, to that which results, namely, thought. The nature of movement is simple and homogeneous in whatever realm of matter it may appear, and, so far as we know, it becomes only motion; but thought, as it appears in reason, will, imagination and judgment, has no resemblance to mere motion. It may be attended by or be dependent upon it, but in its essence and qualities it is so unlike it that the two cannot be compared. Mere movement of cell, whether simple or complex in its constitution, therefore, becomes as unscientific as an explanation of thought as mere movement of spirit.

Such considerations are thought to require that, in the solution of the thought problem, another element must be added. This resides in the brain and nervous system, and in the processes of thought, reflection, memory, and judgment, there exists a correspondence or parallelism of action between the cell and this additional element. The one may act upon, or be acted upon by, the other through impressions from without, and in this action and interaction, the quality and character of thought becomes modified, approved or disapproved, and in some measure changed.

Such, then, in briefest words are the hypotheses which have been advanced as explanatory of normal mentality. How far either of them may or may not be likely to meet with future demonstration, it is not my purpose to argue, even if it were a legitimate subject for such an occasion, but simply to call attention to the fact that neither of these hypotheses has yet been accepted by all; and also that physiology has not yet vouchsafed to us any scientific demonstration on this matter.—*Henry P. Stearns, M.D., address before the Association of Medical Superintendents, etc.*

THE PROPOSED RACE BETWEEN FAST STEAM YACHTS.

The trial of speed shortly to come off between the two fast steam yachts Vamoose and Norwood, over an 80 knot course in Long Island Sound, has attracted a large degree of public attention, particularly among all who are in any way interested in yachting. The course is of sufficient length to thoroughly test the qualities of the racers, and is laid due west from Fisher's Island to a point opposite the Larchmont Club house, near the western end of the Sound. Our first page illustrations give a good idea of the general appearance of the two boats, accompanied with drawings of their machinery, in which connection is also presented a view of the Cushing, our fast torpedo boat, which yachtsmen generally had hoped would be a participant in the race, but which the government officials could not, under the navy regulations, consent to.

The Vamoose was built by the Herreshoffs, of Bristol, R. I., for Mr. W. R. Hearst, of San Francisco, and her cost is said to have been $65,000. She is 112 feet 6 inches long over all, and about 108 feet long on the water line, her extreme beam being 12 feet 4 inches and her greatest draught 4 feet 11 inches. Her hull consists of a steel frame, uncovered in the interior of the boat, and with an outer covering of two layers of pine, the inside one of which is seven-eighths inch thick white pine and the other five-eighths inch thick yellow pine, there being nothing in her in the way of finish or decoration. Her engine is quadruple expansion, and there are five cylinders, of the following diameters: one of 11¼ inches, one of 16 inches, and three of 23½ inches each, the stroke, common, being 15 inches. The propeller shaft is 5¼ inches in diameter. The condenser is of copper, and is 5 feet 3 inches long and 31 inches in diameter, containing 498 feet of tubing, the circulating pump being worked by an independent little engine. The engine and its equipment weighs 13⅓ tons, and is designed to develop 800 horse power. The boiler is of the Thornycroft pattern, and is 8 feet 4 inches long and 8 feet 6 inches in diameter. It has three main drums and 8,500 feet of cold drawn steel tubing. Forced draught is afforded by a fan working up to 1,000 turns a minute. The smokestack is 8 feet high above the deck, and is 36 × 21 inches in diameter. The boat is lighted by electricity generated by a Riker motor. She has a three-bladed Seise propeller, shown in one of our views. It is 54 inches in diameter, and drops 21 inches below the lowest part of the keel. It is designed to be revolved 400 times a minute to propel the boat at full speed.

PROPELLER OF THE VAMOOSE.

The Norwood was built by C. D. Mosher, of Amesbury, Mass., for Norman L. Munro, of New York. She is only 63 feet 2 inches long over all, and about 60 feet long on the water line. She is 7 feet 2 inches beam amidships, and her greatest draught is 23 inches, her draught forward being only about 9 inches. A cross section of each boat at the midship section shows a nearly semicircular bottom. The hull is built of two thicknesses of mahogany on a strong oak frame, and has a steel keelson. The stern is cut away to make room for the propeller, which has three blades, and is 36 inches in diameter. It has a pitch of 7 feet 6 inches, and is designed to be driven at the rate of 500 turns a minute. The engine is of the triple expansion type, the cylinders being 9 inches, 14½ inches, and 22 inches in diameter respectively, and the stroke 9 inches. At 500 revolutions a minute the engine is designed to develop 450 horse power. The boiler is somewhat of the Thornycroft type, but with important modifications. It is 7 feet 4 inches long and 5 feet high, the working pressure being counted at 200 pounds and over. The condenser is 6 feet long and 18 inches in diameter. The smokestack rises 3 feet 9 inches above the top of the boiler, and it is 18 inches in diameter. In cruising trim the boat is covered with an awning which may be inclosed with glass, but in racing order she is stripped to the hull.

Table Customs of Our Ancestors.

A thousand years ago, when the dinner was ready to be served, the first thing brought into the great hall was the table. Movable trestles were brought, on which were placed boards, and all were carried away again at the close of the meal. Upon this was laid the tablecloth, which in some of the old pictures is represented as having a handsome embroidered border. There is an old Latin riddle of the eighth century in which the table says: "I feed people with many kinds of food. First I am a quadruped, and adorned with handsome clothing; then I am robbed of my apparel and lose my legs also." The food of the Anglo-Saxon was largely bread. This is hinted in the fact that a domestic was called a "loaf-eater," and the lady of the house was called a "loaf-giver." The bread was baked in round, flat cakes, which the superstition of the cook marked with a cross, to preserve them from the perils of the fire. Milk, butter and cheese were also eaten. The principal meat was bacon, as the acorns of the oak forests, which then covered a large part of England, supported numerous droves of swine. Our Anglo-Saxon forefathers were not only hearty eaters, but unfortunately deep drinkers. The drinking horns were at first literally horns and so must be immediately emptied when filled; later when the primitive horn had been replaced by a glass cup, it retained a tradition of its rude predecessor in its shape, for it had a flaring top while tapering toward the base, so that it, too, had to be emptied at a draught. Each guest was furnished with a spoon, while his knife he always carried in his belt; as for forks, who dreamed of them, when nature had given man ten fingers? But you will see why a servant with a basin of water and a towel always presented himself to each guest before dinner was served and after it was ended. Roasted meat was served on the spit or rod on which it was cooked, and the guest cut or tore off a piece to suit himself. Boiled meat was laid on the cakes of bread, or later on thick slices of bread called "trenchers," from a Norman word meaning "to cut," as these were to carve the meat on, thus preserving the tablecloth from the knife. At first the trencher was eaten or thrown upon the stone floor for the dogs which crouched at their master's feet. At a later date it was put in a basket and given to the poor who gathered at the manor gate. During the latter part of the middle ages, the most conspicuous object on the table was the salt cellar. This was generally of silver in the form of a ship. It was placed in the center of the long table, at which the household gathered, my lord and lady, their family and guests, being at one end and their retainers and servants at the other. So one's position in regard to the salt was a test of rank—the gentlefolks sitting "above the salt" and the yeomanry below it. In the houses of the great nobles dinner was served with much ceremony. At the hour a stately procession entered the hall. First came several musicians, followed by the steward bearing his rod of office, and then came a long line of servants carrying different dishes. Some idea of the variety and profusion may be gained from the provision made by King Henry III. for his household at Christmas, 1254. This included thirty-one oxen, one hundred pigs, three hundred and fifty-six fowls, twenty-nine hares, fifty-nine rabbits, nine pheasants, fifty-six partridges, sixty-eight woodcocks, thirty-nine plovers, and three thousand eggs. Many of our favorite dishes have descended to us from the middle ages. Macaroons have served as dessert since the days of Chaucer. Our favorite winter breakfast, griddle cakes, has come down to us from the far-away Britons of Wales, while the boys have lunched on gingerbread and girls on pickles and jellies since the time of Edward II., more than five hundred years ago.

A Remarkable Ferryboat.

One of the most extraordinary boats on the American lakes is a passenger car transfer ferryboat operated in the Straits of Mackinac by the Duluth, South Shore, and Atlantic Railroad. It has an enormous capacity for carrying cars, but its peculiarities are its strength, its shape, and the number of its steam engines. It carries twenty-four steam engines for the performance of the various requirements of its daily business. The hull of the boat is as solid as the walls of an old-time block house. The bow rises from the water so as to hang or slant over it as if it were a hammer—and that is what it was built to be. The boat is an ice breaker, intended to keep a channel open in the straits during the winter, or to make one whenever it is pushed into the massive ice that forms in that cold region. The big boat advances toward the ice and, shoving her nose upon its edge, lifts herself upon it. Then a screw propeller under the overhanging bow performs its work of sucking the water from under the ice to enable the boat's weight to crush it down the more easily. Thus the destructive monster makes her way steadily through the worst ice of the semi-polar winters of that region, climbing up on the ice, crushing it down, scattering it on each side, and making no more of it than if it were so much slush.—*Iron Age.*

THE PELTON WATER WHEEL AND MOTOR.

The Pelton water wheel, which is illustrated in the accompanying engraving, has attracted considerable attention as an efficient motor for generating electric light currents and for use in connection with mining and manufacturing interests. Where any considerable head can be obtained, the amount of water required to run the motor is not very great. This motor is manufactured by the Pelton Water Wheel Co., with main offices at 121 Main Street, San Francisco, Cal., and with a branch office at 143 Liberty Street, New York.

The Pelton Water Wheel Company have recently placed upon the market a series of small wheels, inclosed in cases, or frames, of neat and substantial design, and, for convenience, they are called motors. These are adapted to light services, and possess in the same proportionate degree the power of the larger wheels. They afford very cheap and reliable power wherever water power is available.

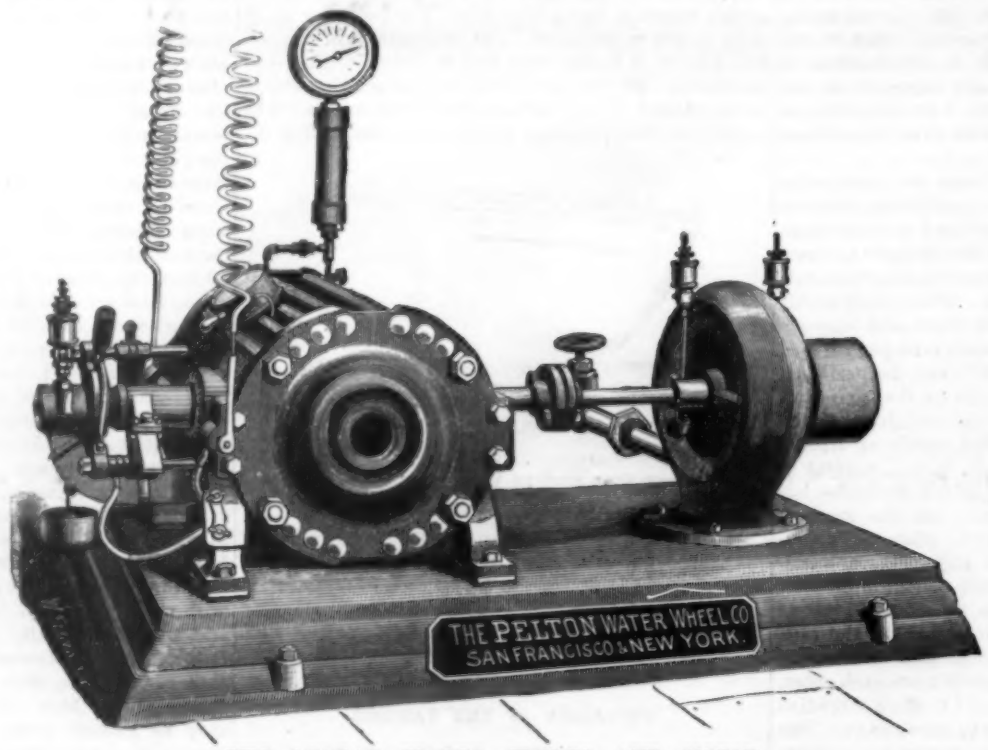
The motor shown in the illustration herewith is a Pelton No. 2, having a 12 in. diameter wheel. As will be observed, its shaft is connected directly with that of a T. & H. dynamo, the coupling being provided with proper insulation. The motor is supplied by water under a sufficient head to afford a working pressure of 140 lb. per. sq. in., which is the proper amount to furnish a speed of 1350 revs. per minute; this in turn is transmitted to the dynamo and affords the desired speed of same. The capacity of the combination is from 55 to 65 incandescent lamps of 16 c. p. each.

Where the head of water and other conditions do not permit attaching the motor to the shaft, as above indicated, it can be connected by a belt direct without any intermediate gear.

As will be seen, the above forms a most simple and effective combination, the motor and dynamo being placed on one solid base plate, and it is an illustration of the convenience and adaptability of these motors to almost every variety of service.

These small wheels have been adopted by many prominent electric light companies throughout the country, on account of their high efficiency and general reliability. Where free water is available, the expense of running any kind of machinery is very little, the first cost being the main consideration.

The enormous waste of power in the unutilized water courses all over the country is beginning to attract general attention, especially as energy can be made available by a variety of means so simple and inexpensive, one of which we have here illustrated.



THE PELTON WATER WHEEL AND MOTOR.

Railways in the Holy Land.

The Turkish government, having decided on the construction of a railway proceeding from Ismidt or Samsun to Bagdad, has invited the administration of the Anatolian Railway and Baron Macar, who received the concession for the Samsun-Sivas line, to a conference in order to consider the best means of attaining its object. The Minister of Public Works has a number of applications for concessions on hand at present. Among them is one from Mehmed Assim Effendi, for the building of a tramway line from Janina to Hanopoulo This tramway would be worked partly by animal traction and partly by steam. Another project is that of Ibrikdarzade Djemil Bey for the construction of a tramway at Broussa.

The Cairo Geographical Society has issued a pamphlet, prepared by Loutfy Bey, of Cairo, with a map in French and Arabic, advocating a railway between Ismailieh and Gaza. The pamphlet contains an interesting summary of various concessions in Syria. It is worthy of note that these enterprises are entirely in the hands of Orientals. Youssef Effendi Navon, of Jerusalem, undertakes three lines radiating from that city to Jaffa, Gaza, and Nablous (Samaria); total, 150 miles. Youssef Effendi Elias, late chief engineer to the government of the Lebanon, proposes not only to unite Damascus with Acre and Haifa, and improve the harbors of the Mediterranean termini, but to put steamers on the Sea of Tiberias; total, 300 miles. Youssef Effendi Moutran, charged with the harbor works at Beyrout, has obtained the right to construct a steam tramway into the Hauran—50 miles. Hassan Effendi Baiohom, also of Beyrout, contracts for the section between Damascus and its port—60 miles. The syndicate for the Damascus-Aleppo system of over 400 miles is in the hands of Messrs. Sola, Ralli & Co., well known Levantine names. Loutfy Bey proposes to devote himself to completing the Syro-Egyptian link of 150 miles. This would bring Jerusalem within seven hours of the Suez Canal.

The Sun Cooling Off.

BY PROF. ALEXANDER WINCHELL, LL.D.

We are not driven to the necessity of summoning exaggerated and imaginary agencies to the destruction of the earth. There are hostile powers reserved for the final conflict that will not be content with directing toward us merely "Quaker guns."

The sun, we say, affords us thirty-nine fortieths of all the warmth which we enjoy, and we feel quite unconcerned about the alleged slow cooling of the earth. To the sun we owe the numberless activities of the organic and inorganic worlds, and we feel quite independent of the waning temperature of this dying ember which we call the earth.

The amount of heat dispensed by our solar orb is truly something the contemplation of which overpowers the imagination. The rays which fall upon a common burning glass, converged to a focus, speedily ignite a piece of wood. The heat which is received by a space of ten yards square is sufficient, as Ericsson states, to drive a nine horse power engine. The amount of heat which falls upon half a Swedish square mile is sufficient to actuate 64,800 engines, each of 100 horse power. The total amount of heat received annually by the earth would melt a layer of ice one hundred feet thick. As the solar heat is radiated equally in all directions, it is easily calculated that the total emission of heat from the sun is 2,300 millions of times the whole amount which reaches our earth.

Such an enormous expenditure of heat is sufficient to reduce the temperature of the sun two and one fifth degrees annually. During the human period of 6,000 years, the temperature would have been reduced more than 19,000 degrees. At such a rate of cooling it is obvious that the sun must speedily cease to warm our planet sufficiently to sustain vegetable and animal life. But it is certain that the sun's high temperature has been maintained during almost countless ages anterior to the commencement of the human era. Those titanic reptiles which could luxuriate only under tropical warmth flourished a hundred thousand years before the world was prepared for man; and those rank, umbrageous ferns, whose forms we trace upon the roof-shales of a coal mine, existed before the reptile horde, and purified the air for their respiration.

What unseen cause has perpetuated, for a million of years, those solar fires? Kepler asserted that the firmament is as full of comets as the sea is of fishes, and Newton conjectured that these comets are the fuel carriers of the sun. Alas! we only know that the wandering comet, though flying in tantalizing proximity to the sun, but accelerates its speed and hurries onward, as virtue hastens past the vortex of ruin. Is it a chemical action which maintains the solar heat? The most efficient chemical action for this purpose is combustion. Now, if the sun were a solid mass of coal, its combustion would only suffice for the brief space of forty-six centuries to replenish the solar system with its vivifying influence. Is it the effect of the sun's rotation on his axis? Such rotation could generate no heat without the resistance of another body. Even if that other body were present, a calculation based upon the sun's mass and his rate of rotation shows that the heat generated could only supply the expenditure for the space of one hundred and eighty-three years.

There exists, nevertheless, a means of recuperation to the solar energy. It is not an exhaustless resource, but it prolongs materially the period of the sun's activity. Though no comet has been *known* to fall into sun, it is now generally admitted that cosmical matter is raining down upon the sun from every direction.

Besides the planetary and cometary bodies which revolve about the sun, it is now demonstrated that the interplanetary spaces are occupied by smaller masses of matter, from the size of a meteorite to particles of cosmical dust. These all are flowing about the sun in a circling stream, but forever approaching nearer and nearer, until they are gradually drawn into the solar fires. The showers of meteoric hail which pelt our earth at certain periods of the year are merely cosmical bodies that have been diverted from their path in certain parts of her orbit. That faint cone of light which streams upward from the setting or the rising sun, near the time of the equinoxes, is but a zone of planetary dust illuminated by the sun's rays—a shower of matter descending upon the solar orb, and rendered visible to us; like the rain sent down from a summer cloud and projected upon the clear heavens beyond.

Arrested motion becomes heat. The blacksmith's hammer warms the cold iron. A meteorite falling through the earth's atmosphere develops so much friction as to generate heat sufficient to dissipate the body into vapor. One of these cosmical bodies falling upon the sun must, by the concussion, produce about 7,000 times as much heat as would be generated by an equal mass of coal. It is thus that the enormously high temperature of our sun is maintained.

But the very mention of this source of recuperation of exhausted solar energy suggests a limit to the process. For how many ages can the cosmical matter within the limits of the solar system be rained down upon the sun without complete exhaustion? The space inclosed by the orbit of Neptune is not infinite. The supply of cosmical matter is but a finite quantity. Time enough will drain the bounds of the solar system of all its wandering particles of planetary dust. What then will be the fate of the sun?

The conviction cannot be resisted that the processes going forward before our eyes aim directly at the final extinction of the solar fire. Helmholtz says: "The inexorable laws of mechanics show that the store of heat in the sun must be finally exhausted." What a conception overshadows and overpowers the mind! We are forced to contemplate the slow waning of that beneficent orb whose vivid light and cheering warmth animate and vivify the circuit of the solar system. For ages past unbounded gifts have been wasted through all the expanding fields of space—wasted, I say, since less than half a billionth of his rays have fallen upon our planet. The treasury of life and motion from age to age is running lower and lower. The great sun which, stricken with the pangs of dissolution, has bravely looked down with steady and undimmed eye upon our earth ever since organization first bloomed upon it, is nevertheless a dying existence. The pelting rain of cosmical matter descending upon his surface can only retard, for a limited time, the encroachments of the mortal rigors, as friction may perpetuate, for a few brief moments, the vital warmth of a dying man.—*Methodist Magazine.*

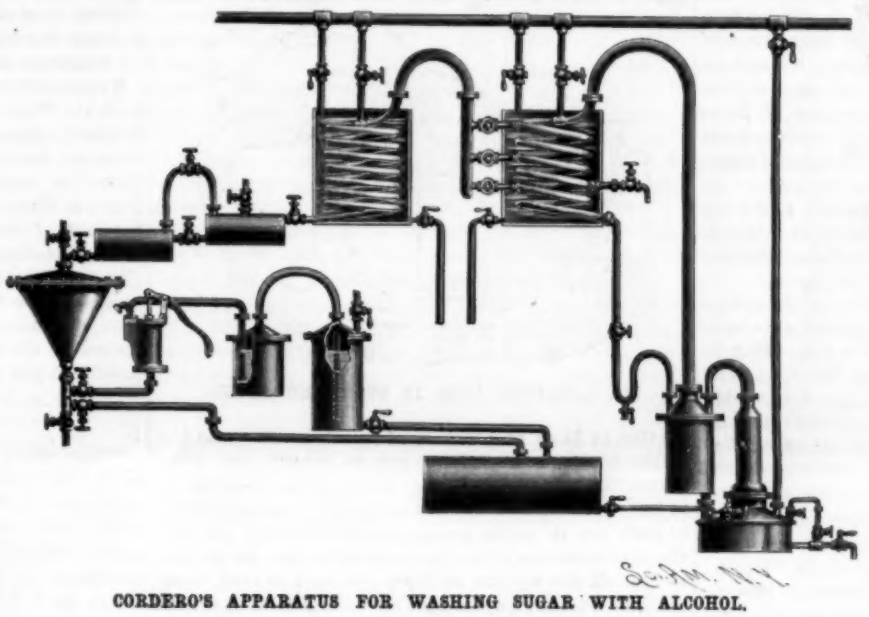
Lake Bonneville.

According to the monograph by J. R. Gilbert, published by the United States Geological Survey—the paper being chiefly geological, but having an important bearing upon the secular changes in climate—Lake Bonneville was the ancestor of the great Salt Lake of Utah, which has frequently altered its level, even in recent years. At the time of the glacial epoch its level was about 300 meters higher, and it occupied about ten times its present area. The cause of the drying up of a large part of the former area is found in the prevailing winds, which, on their way from the Pacific and in their passage over the Sierra Nevada, have precipitated much of their moisture, and pass over this region as drying winds.

A SOLUTION of bichloride of mercury is about the best material for taking indelible ink out of linen.

WASHING SUGAR WITH ALCOHOL.

The advantages derived from the washing of sugar by alcohol, under the processes heretofore practiced, have been attended with the serious drawback that this method was very expensive, owing to the quantity of alcohol used. In the apparatus shown in the accompanying illustration, which has been patented by Mr. Ramon F. Cordero, of Rubio, Venezuela, the alcohol used for washing a charge of sugar is retained and made to circulate within the apparatus to wash succeeding charges, with but little or no waste of the alcohol, the operations of washing the sugar and distilling or condensing the alcohol being kept up in succession, the washing of a charge of sugar going on simultaneously with the separation of the alcohol from the molasses washed out of a preceding charge.



CORDERO'S APPARATUS FOR WASHING SUGAR WITH ALCOHOL.

The sugar to be washed, in commencing work with the apparatus, is placed in the cone-shaped vessel shown at the left in the picture, being pressed down and covered with canvas, over which is placed a piece of wire cloth to uniformly distribute the alcohol, after which the cover is screwed on. The alcohol, preferably of about 38°, is then supplied through a cock in the top of the second of two horizontally arranged vessels just above, the connections being opened for its discharge over the sugar, to percolate through it. Just below the sugar cone is a glass section in the discharge tube, through which the progress made in washing out the molasses may be observed, and as it commences a cock is gradually opened in a pipe leading to the lower large horizontal tank, the opening of this cock and of the one supplying the alcohol being so regulated that the molasses will be washed out of the sugar with the alcohol and delivered into the large tank without making the sugar run. When it is seen through the glass section of the discharge tube that the alcohol passing contains no more molasses, the two cocks are closed, and a cock admitting air into the top of the sugar cone is opened, as is also another cock in a pipe leading to a pump, whereby either hot or cold air may be drawn through the washed sugar until no smell of alcohol can be detected, there being in the discharge pipe of the pump a small orifice or odor detector at which any smell will be readily perceptible.

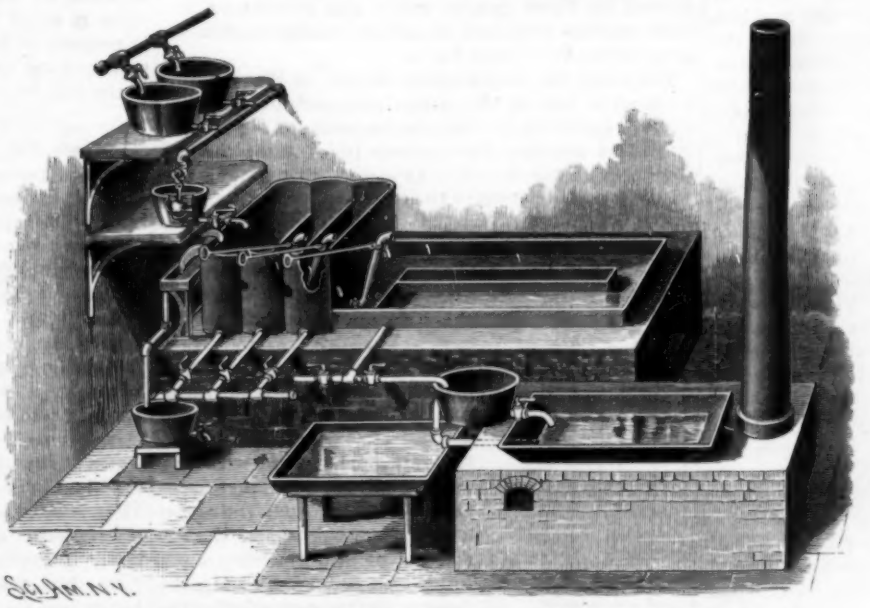
The air thus charged with alcohol extracted by the pump is passed through two washers, where the alcohol is left in the water, the air escaping from a cock at the top of the second washer, while the alcohol and water are discharged into the tank into which the molasses had been previously washed from the sugar. The sugar may now be taken from the cone and a fresh charge put in, and meanwhile the molasses diluted by alcohol and water in the large tank is passed to a boiler where heat may be applied, the boiler being surmounted by a chest connected with a trapping chamber, an uptake from which leads to the top of the first of a pair of stills. The boiler has a cock for the discharge of molasses and all impurities, and one for the escape of air as the boiler is charged, together with a gauge for ascertaining the condition of the charge at any time. The stills are supplied with cold water outside the coils through suitable pipe connections, through which also the boiler is supplied, and water may be admitted to the coils themselves when required. The coil of the first still is connected at its lower end by a trapped pipe with the trapping chamber, for sending back alcohol of low grade, and this still is also connected by cocks at different points in its height with a pipe leading to the upper end of the worm of the second still, to allow alcohol of a high grade to pass over. From the latter still the alcohol passes to the receiver, the air escape pipe at the top of which affording the channel through which the apparatus is first charged with alcohol in commencing operations. A valved pipe leads from the bottom of the receiver to another receptacle having a valved connection with the sugar-washing cone, while a curved air pipe, having a cock at its highest point, provides for the passage of air between the two receptacles. Steam or other heat may be used in working the apparatus, which is designed to effect a great saving of labor as well as produce larger returns, because of the insolubility of the sugar in the alcohol and the better quality of the sugar obtained. Further particulars relative to this invention may be obtained by addressing Mr. Diego Parra, P. O. box 3339, New York City.

Electric Roads for Farmers.

This use of electric roads for farms is destined, says the *Electrical Engineer*, to be enormous. At the present time the state of the vast majority of our rural highways is such as to render transportation a frightful tax upon production. But nothing is easier than to track and wire these roads, furnish them with motor trucks upon which the farm wagons can be run fully loaded, and then turn on the current at stated intervals from the power house in the nearest town or at the nearest water power. These electric roads will continue running through winter and spring months when the ordinary dirt roads are utterly impassable and when the multitudes of draught horses kept by the farmers are simply eating their heads off in idleness. In 1880 there were 2,000,000 such horses on American farms. The bare possibility of getting promptly to market will stimulate the farmer to cultivate crops that now he dare not dream of. Moreover, the speed made will effect a most tremendous economy in the farmer's time.

AN IMPROVED SUGAR MAKING APPARATUS.

The apparatus shown in the illustration has an extensive heating surface, providing for the necessary concentration of the juice by using only cane refuse or bagasse for fuel, and is designed to be operated with but little labor to afford an improved quality of product, from the successive cleaning of the juices in the several pans, and the removal of the scum, before the juices are passed to the evaporating pan. The improvement has been patented by Mr. Ramon F. Cordero, of Rubio, Venezuela.



CORDERO'S SUGAR DEFECATING AND EVAPORATING APPARATUS.

The saccharine juices, as they come from the mill, are conducted to the receptacles shown at the top of the picture to the left, from which, in order to keep up a continuous action, they are alternately passed into a lower receptacle, the flow into which is regulated by an automatically operating cock controlled by a float. From the latter receptacle the juices are passed in properly regulated quantities into the first of a series of scumming or cleaning pans, the adjacent dividing walls of which are of different heights, the wall separating the first and second pans being lower than that dividing the second from the third. The pans are connected to discharge one into the other in succession by rising and falling or adjustable tubes, operated by handles, the third pan of the series discharging, when its tube is adjusted for the purpose, into the evaporating pan, which has interior walls forming a return passage to cause a circulation of the juices along one side and then back along the other side until the outlet pipe is reached, by turning a cock in which the concentrated juices are run into another receptacle. From thence they may be discharged through a cock into a teache or pan heated by a furnace, there being a revoluble tube having a nozzle at its outer end communicating with the interior of the pan, so that by turning the nozzle end downward the contents will be run into the crystallizing pan of the apparatus. The outlet pipe of the evaporating pan has an extension through which water may be passed when required, and a tube leads from the bottom of each of the scumming pans for the discharge of impurities and the water with which the pans are cleaned into a receptacle provided therefor, while at one side of the first of the scumming pans is a chute or plane over which the dregs scooped from the pan are passed to a receiver from which a pipe leads to the same receptacle. The furnace upon which the scumming pans and the evaporating pan rest has an interior flue beneath and corresponding to the return passage of the evaporating pan, the products of combustion being conducted through this flue to the chimney, whereby the heat may be fully utilized.

In commencing operations, the evaporating pan is supplied with sufficient water to keep it from burning until the juices are delivered to it, the juices being allowed to flow into the scumming pans until their level reaches that of the outlet end of the last of the adjustable tubes, which is set to the height of the division between the first and second scumming pans, when the admission of more juice is shut off, and fire is started in the furnace under the pans, into which had been previously placed the materials used for defecation. The scum rising to the surface is then removed by means of a colander or large ladle, and more juice is admitted, the graduating cock over the first pan allowing only so much of the juice as the evaporating pan is capable of concentrating at a time to flow into the first pan, and from thence in succession to the two other pans and to the evaporating pan. By the time the juice arrives at the outlet end of the passages of the evaporating pan it will have been converted into molasses, in which state it is delivered to the next pan or teache, and is passed from thence to the crystallizing pan, where it is stirred, to cause it to lose the greater portion of its heat until it reaches the proper consistency to be put in moulds. The apparatus may be run night and day, the feed being regulated to furnish a continuous stream, affording known or given quantities of molasses to the final concentrating pan. When the mills are not at work, the whole apparatus can readily be thoroughly cleaned, water being passed through for the purpose.

For further particulars in reference to this invention, address Mr. Diego Parra, P. O. box 3339, New York City.

Corset Burning at a Revival.

In our paper for September 19 last we quoted a report from the New York *World* of the alleged proceedings at a meeting of the Free Methodists at Sydenham, Canada, when, under the exhortation of the preacher, women were said to have burned their corsets on the spot. Our confidence in the *World*, it appears, was sadly misplaced. An esteemed correspondent, Mr. J. E. Bristol, writes us that the *World* report was a fabrication from beginning to end. No such meeting or proceedings ever took place.

To remove a wart, cover the skin around the wart with lard, apply over the surface of the growth one or two drops of strong hydrochloric or nitric acid; then keep the part covered up until the scab separates.

Correspondence.

To the Editor of the Scientific American:

In a recent discussion against the existence of a "Gulf Stream," the statement was made as an argument that steamships from England to New York, practically against the current, made as good time as from New York to England. Is such the case, and if so, what reason can be advanced for the fact?

"GULF STREAM."

[By a glance upon a chart of the movements of the Gulf Stream and other ocean currents, it will be seen that the paths of the ocean steamers are only partially with or against the Gulf Stream in their trips east or west. The northern limit of the Gulf Stream swings over a space of 4 to 5 degrees off the coast of Newfoundland and proportionately along the eastern coast of the United States, pivoting upon the narrow channel between Florida and the Bahamas.

The Greenland current sets to the south and west, between the coast and the edge of the Gulf Stream, while the Gulf Stream sets to the northeast between Newfoundland and the west coast of England.

When the east or west passage is made in the spring or summer months, the currents encountered are about equally divided—the eastern half of the trip being in a current setting northeast to north-northeast, and the western half in a current setting from south to southwest. The northern drift of the Gulf Stream during the latter half of the year will probably show a difference in favor of the eastern trip by the continuous set of the current to the eastward, owing to the northern position of the Gulf Stream. Thus the equal east and west trips of steamers the past season cannot be an argument against the existence of the Gulf Stream; its existence is well established by a thorough investigation of its phenomena and rate of motion during the past hundred years. It was a philosophical question in Dr. Franklin's time.—ED.]

Jet Propulsion.

To the Editor of the Scientific American:

I promised some time ago to give you my ideas on hydraulic propulsion, and as I am fully protected have no hesitation in doing so. It appears from the correspondence you have published on the subject, because the screw is worked on the stern of a vessel (the only available place for it), the jet should be there also.

I place the discharge on the bottom, a little aft of midships, where the resistance will be found the strongest. To add to the resistance, the projection of discharge pipe below the hull (not round in shape) has a tendency, and, in fact, would form an eddy, if the discharge would permit; but to still further increase the resistance, I use four double-acting pumps, two on each side. One has a vertical, the other a horizontal discharge, one opening immediately over the other, at a right angle. The two discharges, coming in contact, will form a curve line, causing the vertical to aid in the propulsion, at all events forming a strong backing. By placing the pumps below the draught line, I get the pressure of the water to help them in filling quick. Another advantage in this arrangement: the friction is reduced to a very small figure. Again, vessels have to be driven astern as well as ahead—a point none of your correspondents seem to touch on. To effect this, I throw the discharge of both pumps through the same pipe, running forward; this would partake somewhat of the form of a jet, although on an extensive scale, and as the body in motion is meeting the resistance, it ought to check the headway very quickly. The pumps should have valve area to correspond with the opening of discharge. A large volume of water discharged at a high velocity is my theory; the larger the body, the larger the resistance. There should be no trouble in getting fifty strokes a minute, making two hundred for the four; however, this would have to be governed by the stroke. In maneuvering, the advantage over the screw system is very apparent; by reversing one set of pumps, the others working ahead, a vessel should turn in very small bounds. In case of an accident to one set of pumps, the other set can be used, and if all should get disabled, there is no screw to drag through the water. This is a brief outline of my plan, which no doubt can be improved on. To enter into all the details would take up too much space in your valuable paper.

CHAS. S. IRWIN.

513 North 11th St., St. Joseph, Mo.

Manual Power Stern Wheel Vessels.

The Commissioner of Chinese Customs at Lappa, near Macao, in his last report mentions a change in the method of navigating the waterways of the Canton province. Only a few years ago the first junk propelled by a stern wheel, worked on the treadmill or Chinese chain pump system, made its appearance at Canton. Experiments were then made to test the relative economy both in time and working expenses of such a vessel compared with one propelled in the usual way by sail. The superiority of the former in both respects having been clearly demonstrated, the stern wheel has come gradually to be fitted to most of the regular trading junks plying on the inland waterways, and these boats are now met with everywhere in the province.

THE STANDARD GAUGE FOR THE M. C. B. COUPLER.

The announcement of the executive committee in relation to gauges and limits for the standard M. C. B. automatic coupler is as follows:

The committee has carefully reconsidered the whole question since the discussion on its report to the convention in June, and in view of this discussion and the action of the convention upon its report, the committee believes that it is the desire of the association to have it act under the instructions of the convention of 1890, and to make arrangements whereby all parties interested may be able to procure sets of gauges, so that all sets will be alike, which can be used to determine whether any and all new couplers of this type are near enough to the standard contour established by the association to insure proper coupling with one another, in so far as it can be insured by close adherence to the standard contour, and also to establish limits of variation for such of the standard rectilinear measurements of the coupler, only, as will promote

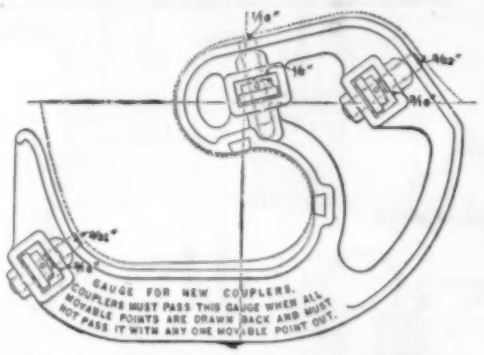


FIG. 1.—DOTTED LINE IS STANDARD GAUGE.

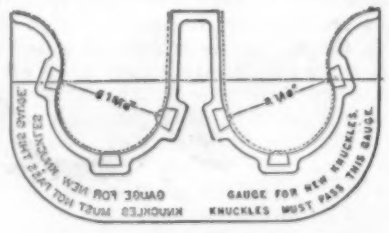


Fig. 2.—COUPLER GAUGES.

the interchangeability of couplers in place upon cars. The committee therefore announces the gauges shown in Figs. 1 and 2 for the contour line and thickness of knuckle, respectively, with the limits of variation allowed by these gauges, and it also announces the limits for the standard rectilinear measurements, as given in the table with Fig. 3.

The gauge for new couplers shown in Fig. 1 is announced in lieu of the gauge proposed in the committee's report to the association, because it provides means for gauging the contour lines, excepting the thickness of the knuckle, at points throughout the whole essential extent of the standard form of contour, and it controls the variation in both directions from the standard, whereas the gauge proposed in the report was only a minimum gauge for a portion of the standard contour, and its use would involve numerous measurements at different heights for the maximum variation, instead of gauging for both limits. The figures shown for the variation allowed with this gauge on Fig. 1 are the same as those recommended in the report at the same points, and the additional point in the back of the knuckle is allowed to vary the same as was recommended at the guard arm.

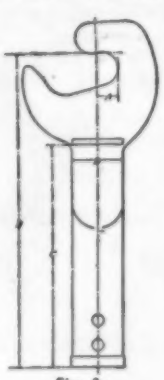


Fig. 3.

	Std.	Max.	Min.
A	2 in.	2 1/16 in.	1 15/16 in.
B	3 "	3 1/16 "	2 15/16 "
C	3 1/4 "	3 5/16 "	3 3/16 "
D	5 in. sq.	5 1/16 "	4 15/16 "

The gauge for new knuckles, shown in Fig. 2, is announced as a proper gauge for knuckles, allowing one-sixteenth inch variation each way from the standard dimensions of 3 inches, instead of one-sixteenth inch one way only, as recommended in the report, because it is thought desirable to allow more than one-sixteenth inch variation on account partly of the necessary taper in cast knuckles.

The limits shown in table with Fig. 3 are announced as proper limits of variation for the standard rectilinear measurements, which are the same as the limits recommended in the report, except that the standard distance, A, of 2 inches, is included herein with an allowable variation of one-sixteenth inch each way and the cross section, D, is allowed to vary one-sixteenth inch each way from the standard measurement of 5 inches instead of only eleven-sixteenths inch one way as recommended in the report. The executive committee considers it inexpedient to announce limits of variation for dimensions which are not standard, but which were mentioned in the report, because the convention ordered that a committee be appointed to report next June on any new standard measurements and limits which may be desirable in connection with the coupler. It is also considered undesirable to provide any specific measuring instrument for the limits of rectilinear measurement given in table with Fig. 3, as these distances may be measured in numerous ways by whatever means are best available.

The executive committee has made arrangements with the Pratt & Whitney Co., of Hartford, Conn., to furnish gauges as shown in Figs. 1 and 2, so that every set furnished will be like every other set and proved by master gauges provided and held by the Pratt & Whitney Company for that purpose, a duplicate set of which master gauges will be filed in the office of the secretary of the association for use in settling any questions in dispute about the accuracy of gauges. The frames of the gauges will be made of the best quality of gray iron, with plain lettering, as shown on the cuts, and the gauging points will be of hardened tool steel.

Water Gas.

When steam is passed through incandescent carbonaceous fuel maintained at 550° to 750° Cent., a gas is produced which consists mainly of hydrogen and carbonic acid, with only small quantities of carbonic oxide. When the fuel is maintained at a higher temperature, the proportion of carbonic oxide increases until, at a temperature of 1,000°, the resulting gas consists of a mixture of about 40 per cent of carbonic oxide and 50 per cent of hydrogen, with only about 5 per cent of carbonic acid. This is known as water gas, and its use is often objected to on account of the poisonous properties of the carbonic oxide contained. The main object of an improvement introduced by Messrs. J. C. Reissig and J. Landin is to produce a gas containing but little carbonic oxide, and to increase its calorific power by removing the carbonic acid from the combustible gases. The process consists in passing steam (preferably superheated) or water through fuel contained in externally heated retorts, or in water gas generators, maintained at 555° to 750° Cent. The resulting gas, consisting of hydrogen and carbonic acid, in the proportion of 2 to 1, is cooled and freed from sulphur impurities in the usual way. It is then passed through an absorbing apparatus containing carbonates of alkali or alkaline earths, preferably solutions of sodium carbonate (soda) or potassium carbonate (potash). These substances readily absorb (especially under pressure) the carbonic acid, forming bicarbonates, from which the carbonic acid is easily removed by the action of a moderate vacuum, especially if aided by heat. The remaining gas consists principally of hydrogen, and ready for use, while the solutions are again available for unlimited repetition of the absorbing operations, etc.

Hints for Merchants Trading with China.

At the recent Congress of Orientalists, Professor Schegel delivered an address conveying some useful hints on European commerce with Eastern countries, and gave some examples of the mistakes made by merchants in sending out goods to China and Java. One instance he gave was the following:

The Chinese are in the habit of boiling their rice in flat iron boilers. These are very thin, and they burn through very quickly. Some English firms thought it would be a very good thing to make these boilers in England and send them to China. Accordingly a shipload was sent to Hong Kong, and were cheaper and stronger than the native boilers; but after a few hundred had been sold, the Chinese would buy no more. They refused to give any reason to the merchants, but the professor asked some of them, and they said to him, "Their boilers are much too expensive." He said, "Oh, but they are cheaper." They said, "Oh, yes, but to boil them we have to use so much fuel. They are too thick, and before we can get our rice boiled we have to spend more in the way of fuel than it would cost to renew our boilers every few months." Another merchant sent out some magnetic horseshoes stamped with the Chinese dragon, but for this very reason the Chinese would have none of them. Merchants did not sufficiently study the prejudices of the people with whom they wished to trade. The Chinese were very particular about lucky and unlucky colors. They liked English sewing needles, but would not buy many of them because they were wrapped up in black paper, black being an unlucky color. Another man developed a very good trade in printed Chinese calendars, and that trade continued good until he commenced printing his calendars on green paper, when his trade closed. He wondered why until he discovered that green was an unlucky color.

NON-VENOMOUS SNAKES.—II.

BY C. FEW SEISS.

In the genus *Pityophis*, containing the pine or bull snakes, are perhaps found the largest or greatest in length of the serpents of the United States. The diamond rattlesnakes of the South are, however, far greater in circumference or bulk. The prairie bull snake of the West frequently attains the length of 8 feet, and according to Dr. Holbrook, our Eastern species has been known to measure 9 feet. From 5 to 7 feet are the ordinary dimensions of pine snakes taken in New Jersey. Woodsmen declare that these snakes at certain times and seasons "bellow like a bull," and hence they are called "bull snakes." I have never had proofs of this, and look upon it with doubt, as their throats contain no vocal organs, and in captivity they are always silent.

12. Pine snake, bull snake, *Pityophis melanoleucus*. Color above, white or pale brown, with a vertebral series of oblong black spots, or brown spots bordered anteriorly and posteriorly with black. These generally widen into bands toward the tail. Below the dorsal row of spots, a second series, sometimes more, of blackish or brown irregular spots and streaks. Beneath pale cream color, with a row of dark spots on each side near where the plates join the scales. These spots occupy portions of two abdominal plates and are generally opposite each other, and at intervals of three to five plates, becoming irregular and finally lost on the tail. Sometimes a few intermediate spots on the abdomen. Head with small black spots, a frontal bar, and a band back of the eyes. Often the ground color of the body is brown, and the spots are not clearly marked, being more or less blended into the ground color. Body long and robust, neck not much contracted, tail one-seventh of total length, and ending in a horny point. Usually 29 rows of dorsal scales, carinated (keeled) above, and smooth on the sides. Found in the pine barrens of New Jersey, and parts of the Blue Mountains of Pennsylvania, south to Florida.

13. Swift garter snake, *Eutænia saurita*. Form very slender, tail long and tapering, about one-third of the total length. Ground color brown to olive black, with three narrow, sharply defined, yellow lines, one vertebral and two lateral, the former margined on each side with a narrow black line. Between the scales blackish, but showing little white streaks when the skin is stretched. Sometimes a series of lateral spots. Beneath light olive green, throat and lips yellowish white. The brown of the head posteriorly and the white of the upper lips sharply divided by a narrow black line. A pair of small light colored occipital spots (rarely wanting), 19 rows of carinated scales. Average length about 32 inches. Found from Maine to Florida and Texas, Kansas, and Wisconsin.

14. Common garter snake, *Eutænia sirtalis*. Form rather robust when full grown. Tail about one-fifth the total length. Color olive brown or gray to greenish black; a vertical and two lateral pale lines. Two rows of alternating black spots on the sides. Sometimes the lines are scarcely visible. For full description and history see SCIENTIFIC AMERICAN for August 16, 1890. In variety *obscura*, the dorsal stripe and spots are scarcely visible on the dark ground color, while the lateral stripe blends into the color of the abdomen. In variety *ordinata*, the three stripes are not well marked, especially the two lateral, but the six alternating rows of dark spots are conspicuous. In variety *dorsalis*, the dorsal stripe is yellowish white, broad, sharply defined, and margined with black; sometimes a row of spots above each lateral stripe.

15. Storer's brown snake, *Storeria occipitomaculata*. Color above, bright brown to grayish brown; sometimes slate color; generally a paler vertebral line from the back of the head to near the end of the tail, which is bordered on each side by a narrow brown line. A yellowish spot behind the occipital plates, and below this another spot on each side. At times the body is uniform in color. No black bar across the angle of the mouth nor under the eye, as in De Kay's snake. Beneath generally salmon red in life, grayish white in alcohol. Lower jaw and throat whitish, minutely flecked with dusky dots. Fifteen rows of carinated scales. Length from 9 to 12 inches. Found from Canada to Florida and Texas, west to Wisconsin.

16. De Kay's brown snake, *Storeria De Kayi*. Color above yellowish brown, with a light-colored dorsal stripe, bordered on each side by a row of small dark spots, the first spot forming a curved blotch on each side of the neck. Sometimes these spots are scarcely visible. A black bar from the occipitals across the angle of the mouth; a small black spot or line below the eye. Beneath yellowish white, with one or two dark dots on each plate, toward the outer edge. These dots are at times wanting. Occasionally a specimen is seen in which the two rows of dorsal spots are united, thus forming short bands across the back, scarcely visible posteriorly. Seventeen rows of carinated scales. Length of adult from 9½ to 12¼ inches. Found from Canada to Florida and Texas, and west to Michigan and Wisconsin.

17. Striped water snake, *Regina leberis*. Color above olive brown to chestnut brown, with three narrow dark longitudinal lines, one dorsal and two lateral. A wider light line or stripe on each side one half scale above the abdominal plates. These lines are well marked in the young, but sometimes nearly disappearing in old individuals. Beneath pale yellow, with four dark longitudinal lines, formed by four spots on each plate. The two external are the larger, and include the dark lower half of the first row of scales. Nineteen rows of carinated scales, the outer row nearly smooth. Average length 22 inches. Young at birth 7 inches. Found from New York to Georgia and Texas, west to Wisconsin. Feeds largely on tadpoles and small frogs; it is not a noted fish destroyer. Found under partly submerged stones along creeks and rivers.

18. Rough water snake, *Regina rigida*. Color olive brown above, with two dark brown longitudinal bands along the back. The edges of the outer row of scales and abdominal plates margined with brown. Beneath dull yellow, with two central rows of dark brown spots, nearer together anteriorly. Nineteen rows of strongly carinated scales, the outer row smooth. Length from 15 to 22 inches. Found from Pennsylvania to Georgia. Some consider this a variety of the preceding, but to me it appears to be a well marked species. Apparently a rare snake in Pennsylvania.

19. Kirkland's snake, *Regina Kirklandi*. Color above reddish brown, with four or three rows of alternating subcircular black spots. Beneath uniform reddish yellow, with a row of small black spots on each side. Head rather convex, glossy deep brown to the edge of upper labials. Tail short, about one-fifth the total length. Nineteen rows of carinated scales. A moderately stout snake, about 16 inches in length. New Jersey and Pennsylvania, west to Michigan. This also appears to be rare in this State; only a few specimens are reported from Delaware County.

WATER SNAKES—T. SIPEDON—ADULT AND YOUNG AT BIRTH.

20. Common water snake, *Tropidonotus sipedon*. Color brown above, with large transverse darker brown blotches margined with black anteriorly, generally breaking up into three series of spots posteriorly. These spots are separated on the dorsal region by narrow whitish bands or spaces, which widen on the sides and merge into brownish red patches. Beneath pale yellowish-brown, with two or more rows of irregular, semicircular, or angular brown spots, edged with darker brown or black; generally darker posteriorly and more or less confluent beneath the tail. Sometimes sprinkled with dusky dots. Often in old snakes the body above becomes uniform dull brown in color, and the spots nearly disappear. In some localities they are nearly uniform blackish-brown above, spotted on the flanks and abdomen; stoutly and firmly built; twenty-three rows of strongly keeled dorsal scales. Length of adult, from 3 to nearly 5 feet. Found from Canada to Florida and west to Nebraska and Arkansas. Common in nearly all of our rivers, creeks and lakes. They frequently make their homes in partly submerged piles of rocks or embankments full of crevices. They will catch and swallow any species of fish they are able to master. I saw a large catfish, armed with its usual sharp spines, taken from the stomach of one, and was informed that a large pike was removed from another. Have known of a well stocked goldfish pond that was completely cleaned out in a few weeks by one or more of these snakes. Eels and frogs also furnish a part of their bill of fare, while the young snakes take kindly to tadpoles. The old snakes do much of their fishing at twilight, or on cloudy days, and moonlight nights. I have heard that large bass have been seen to fearlessly attack and devour young water snakes when a foot and less in length. "Copper-belly," variety *Erythrogaster*. Color uniform bluish-black to rusty black above, lighter on the sides, often with a dull blue lateral band. Beneath dull coppery yellow. At times the front edge of each abdominal plate is bluish. No distinct spots on the abdomen. Faint dorsal spots in young specimens. Found in the great lakes and their rivers. Have not met with it in Pennsylvania or New Jersey. Frequent South. Variety *fasciatus*, banded water snake. Above uniform dark brown in adult; lighter in younger individuals, with black patches on the back; a row of about thirty red spots on each side; obsolete in old animals. Upper jaw white, tinged with red. A dark band from the eye to the corner of the mouth. Beneath reddish-white. Perhaps not found north of Virginia; common South.

21. Holbrook's water snake, *Tropidonotus taxispilotus*. Color reddish-brown, with three rows of subquadrangular dark spots; the ground color between the spots about the same width as the spots. Beneath yellowish, clouded with dark brown. Head rather small, with the snout somewhat pointed. Twenty-nine to thirty-one rows of carinated scales. Specimens in United States Natural Museum labeled from New York and Georgetown, D. C. (?). A Southern species. Serpents belonging to the following genus, *Heterodon*, can be easily identified by their up-curved, shovel-like snouts, and the manner in which they flatten themselves and blow when approached.

22. Spreading snake, hog nosed snake, *Heterodon platyrhinus*. Color yellowish gray, or brown, to reddish brown, with about 25 dark brown or black spots along the back, from the head to above the vent, and about 10 half rings on the tail. The spaces between the dorsal spots are generally lighter, and the spots themselves edged with whitish. A series of dark lateral spots; one spot opposite to each light dorsal space. Beneath these several series of smaller spots, indistinct or absent. Throat yellowish; abdomen more or less pale olive or yellowish, clouded posteriorly with darker olive brown or slate color. A dark bar runs from eye to eye, anteriorly across the head; another posteriorly, often broken into spots. Two dark bands run from the occipital region down the neck, often with a spot between them, and another from the eye backward. In maritime specimens the head is often uniform brown, and they are duller and grayer in coloration than the inland specimens. The little linear plate which runs up the central part of the snout, behind the rostral plate, called the azygos, is not surrounded by a border of small scales, as in the smaller hog snake of the South, *H. simus*, but is in contact with the frontal plates. Generally 25 rows of carinated scales, the first row smooth. Length when full grown about 2 feet. Found from Massachusetts to Florida and Texas, and west to Minnesota. Along the coast it feeds almost entirely upon toads. Black hog nosed snake, "black viper," variety *niger*. Black or dark olive brown above; beneath slate color, fading into white on the chin and edge of the upper labials. Length from two to three feet. Found from Pennsylvania to Florida and Texas and Illinois. A truly formidable-looking snake. It flattens its neck and head, blows violently, and throws itself into rigid contortions when confronted, and will strike wickedly at an object placed within its reach. It has large, somewhat fang-like teeth, and is often considered venomous, but it is, however, perfectly harmless, as it does not possess poison glands with which to secrete venom.

Maximum Locomotive Speed.

Most experienced railroad men feel that the possibilities of steam practice are nearly reached, and that much greater speed is not practicable. A maximum of ninety miles an hour, with a running speed of sixty to seventy, is all that can be hoped for under the very best conditions. The limitations are numerous, and are well known to all engineers. The maximum speed of which a locomotive is capable has not been materially increased in a number of years. The schedule time has been shortened, principally by reducing gradients, straightening curves, filling up ravines and replacing wooden structures by permanent ones of iron or stone; by the use of heavy rails, safer switches, improved methods of signaling, the interlocking switch and signal system, the abolition of level crossings; in fact, by improvements in detail and management which permit a higher speed on a more extended section of road because of greater safety and the greater degree of confidence inspired in the engine driver.

To obtain a dark finish on oak and ash, inclose in a box or closet with some saucers or plates of strong ammonia. The fumes will darken the wood.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING. — Samuel A. Cloud, Lenni, Pa. This is a simple form of automatic coupling in which the link consists of a single bar having at each end an annularly grooved cylindrical head, with spring-supported segments arranged in the grooves, adapted for engagement by internal shoulders of the drawhead, pusher bars being movable against the segments by means of a lever, to force the segments into the grooves of the link for disengaging it. The outer edges of the spring-supported segments are beveled, and readily enter the cylindrical bore of the drawhead, where they are forced outward by their springs to engage the shoulders and effect the coupling.

CAR AXLE BOXES. — John Donnelly, London, England. This invention relates to a method of manufacturing axle boxes from sheet metal plates by successive stamping, pressing and bending operations, avoiding the necessity of planing or otherwise machining the horn plate grooves out of the solid metal. The blank is subjected to the successive action of dies to form the horn plate grooves and the projections and depression for the reception of the box lid appurtenances, the blank then being bent into box-like form and its meeting edges welded together. All of the tools for forming the shell and liner are preferably operated by hydraulic pressure applied in the ordinary way, although other mechanical power may be used.

Mechanical Appliances.

WARP LINKING MACHINE. — William A. Denn, Philadelphia, Pa. This is a machine for looping and double-looping or linking warps, providing therefor a needle which will operate as well with small as large warps, automatically producing the links. The machine has a reciprocating distributing horn below which is a stationary trip bar with inwardly carved stripping fingers in front of it, the linking needles reciprocating alternately in opposite directions below the path of the distributing horn and above the trip bar and stripping fingers. Each needle has a hook at one end, a concaved surface between the center and the hook, and a retaining plate pivoted at one end beneath the concaved surface and the hook and capable of folding over one or the other.

WINDMILL REGULATOR.—Edward B. Wilson, Central City, Neb. The device provided by this invention is more especially adapted for use with windmills used for pumping water, automatically controlling the mill, to set it in operation when the water in the tank gets low and stop it when the tank is full. A float in the tank is connected with one arm of a bell crank lever whose other arm is connected by the aid of simple intermediate devices with a clutch for throwing the wheel into and out of the wind. The regulator may be operated by hand when the windmill is to be used for other purposes than filling a tank.

HOISTING MACHINE. — James Arthur, Jersey City, N. J. This is a power hoisting machine to be applied to the ordinary hand hoist, and has a pair of shafts, one fixed and the other movable, each carrying a grooved sheave for gripping the rope, while the shafts have palleys to receive driving belts, the movable shaft having a pivoted hanger and lever for moving it to cause the sheaves to bite the rope. The swiveled hanger box is of novel construction, allowing the movable shaft to move without binding, and there is an interchangeable arrangement of the hangers and lever, whereby one or the other of the hangers and shafts may be made movable, and by which the operating lever may be arranged to be lifted or depressed from either side of the machine to adapt it for use in any locality.

RATCHET BRACE. — Henry C. Fraser, Charleston, S. C. This brace is made with two sleeves in which the tool shank is adjustably held, a ratchet wheel being carried by each sleeve, while a U-shaped handle arm has its ends mounted to turn on the sleeves and has pawls engaging the ratchet wheels. The arrangement is such that the brace can be conveniently shifted on the shank of the tool, permitting the use of tools of considerable length for boring deep holes. While a large purchase power is obtained, the construction is simple and durable, and the tool is easy to operate.

CENTRIFUGAL GOVERNOR.—Henry L. Berger and Edouard Noel, Abbeville, La. This invention provides an improvement on a former patented invention of the same inventors. A pulley is secured on the main driving shaft, and a valve eccentric is mounted on an arm pivotally connected with the pulley and having a slot through which the main shaft passes. A second arm is pivotally connected with the first arm beyond the shaft and carries a second eccentric mounted loosely on the main driving shaft, while a weighted and spring-pressed lever is pivoted on the pulley and pivotally connected with the second eccentric to control its movement. This governor is designed to be very effective and accurate in operation, while being simple and durable in construction.

Agricultural.

HAND PLANTER. — Seth Hackett, Bronson, Mich. This is a device which may be operated by one hand, and has a standard with a handle at its upper end and a blade at its lower end, the hopper being secured on the standard and having a single bottom perforation to feed grain through a downwardly tapering delivery chute. A feed disk within the hopper is operated by a link rod extending to a pivotally connected lever which is also connected with a fulcrum foot that rests on the ground, the tilting of the standard opening the blades in the ground to allow the grain to pass out. The machine is of the class known as reciprocating hand planters, and is of few and simple parts.

PRUNING IMPLEMENT. — Andreas Bosch, Prairie du Chien, and Frederick Bosch, Merrill, Wis. This invention primarily provides a socket upon a handle into which a number of pruning and trimming implements may be expeditiously inserted and securely clamped in position, so that the implements may be readily and effectively used high up on trees while the operator stands on the ground. The various implements also have special forms of shanks adapted to fit neatly and securely into the socket and be clamped therein, all of the implements being secured in the same manner, and being quickly and conveniently removed.

CORN HARVESTER. — John Bardill, Grant Fork, Ill. The body of this machine consists of a three-wheeled platform having rearward inclined cutters at opposite sides of the center of its forward edge, there being stalk-receiving compartments at the front portion of the platform and spaces for the operators at the rear. As the implement is drawn forward between the rows of corn, the knives sever the stalks in their path, the stalks falling into the compartments and forming themselves into two independent stacks which may be readily removed by the operators, who are effectually protected from danger of cutting by the knives by longitudinal and transverse guard rails.

PLOW.—Carl W. Larsen, Medical Lake, Washington. Pivoted to the plow beam is a knife extending downward in alignment with the share of the plow, while there is an adjusting bar to which is attached a spring plate, and a chain connection between the plate and the knife. The attachment is designed for use in working ground where roots, stones, etc., are numerous, and may be readily carried out of the way when the plow is used as a stubble plow.

WEED MASHING IMPLEMENT. — James W. Hammett, Eureka, West Va. This is a machine which has a fluted and twisted shaft journaled in a frame adapted to be drawn over the ground, and having blades arranged alternately, and is designed to mash down weeds, bushes, briers, etc., to render the ground firm before planting, and also for setting broadcast seed into the ground.

Miscellaneous.

DYEING WOVEN FABRICS. — George Morlot, Paterson, N. J. In the dyeing apparatus provided by this invention the frame to be placed in the vat has brackets projecting from its upper side rails, with two series of rollers mounted between the upper and lower side rails, rollers mounted above the end upper rollers, and adjustable tightening rollers in the brackets. The arrangement is such that all strain is taken off the fabric, which is made to travel easily and smoothly and without undue stretching, while it is conveniently passed in its entire width through the dyeing liquid, to evenly saturate the fibers and insure perfect work without any streaks.

WATCH CASE BACK. — Paul Stucker, Brooklyn, N. Y. This invention provides, as an improved article of manufacture, a back having an attached plate cut in intaglio with the cut surfaces filled with enamel, raised metal figures being grouped around and adjacent to the plate, the thickness of the raised metal figures corresponding mainly to that of the plate. It is also provided that the back may be of very thin metal and yet be strong and stiff and highly ornamental with the raised and enameled figures.

WATCH MAKER'S TWEEZERS.—Olavus Kolstad, Pleasant Hill, Mo. The jaws of these tweezers are flattened on their inner and rounded on their outer faces, while there is a transverse groove across the inner face of one of the jaws to receive the pin to be grasped, and a catch pivoted to one member is adapted to swing over both members to prevent them from springing too far apart.

HEARTH, ASH PAN AND FENDER.—Emily C. Stewart, Birmingham, Ala. This is a combination portable device for open fireplaces, the fender serving also as the handle of the pan. It consists of a receptacle covered at its forward end, to form a hearth, and open at its rear end to receive the ashes as they accumulate, while a combined folding handle and fender are pivoted to the top of the receptacle. The combination device forms but a single article, and when the ash receptacle becomes filled the handle and fender are turned up to form a handle by which the pan can be readily removed and the ashes taken care of without any sweeping or shoveling.

INFUSING COFFEE OR TEA. — Ludwig and August Chronik, Brooklyn, N. Y. This is a simple apparatus for automatically performing the operation of making tea or coffee. A boiler is hung upon a counterbalanced lever controlling a lamp extinguisher, the flame of the lamp heating the water in the boiler until sufficient steam is generated to cause the water to flow through a pipe having a rose jet, by means of which the boiling water is directed upon the ground coffee or tea previously placed in a receptacle provided therefor, the counterbalanced lever then extinguishing the lamp, and the vacuum resulting when the steam is condensed causing the infused liquid to be drawn back in the boiler, ready for use.

BALANCE SCALE.—Richard M. Shaffer, Baltimore, Md. This invention is designed to dispense with the use of detached weights as customary in the usual forms of counter scales, while also retaining the advantages of weighing by weights instead of springs. This is effected mainly by placing one of the pans of the balance at a lower level than the other and providing a series of weights connected with a series of pulls or adjusting handles, by moving one or several of which one or more weights will be placed in the pan to weigh any body placed in the other pan, the pulls being each plainly marked with the weights they represent.

SHOW CASE ALARM. — Rudolph C. Kruschke, Duluth, Minn. The show case provided by this invention has a number of metallic strips on its floor, and the trays have spring clips for holding the articles shown, the spring clips being connected electrically and held open by the articles, while the tray itself is furnished with contact points bearing on the metallic strips on its floor, the strips being in the circuit of a battery in which is included an electric alarm bell. When an article is removed from any one of the clips the contact points come together and close the circuit, giving an alarm, or if the article is removed when the tray is out of the case, the alarm will be given when the tray is put back.

BULKHEAD. — George J. Cook, New Orleans, La. This invention provides a construction designed to be strong, simple and durable for the protection of levees on rivers. Piles are driven into the levee and partly into the natural soil, and posts are driven behind the piles into the natural soil, braces extending upward from the posts to the piles. A covering or sheathing is secured to the front of the row of piles and extends into the natural soil a suitable distance below the base of the levee, and at suitable intervals a pipe or pipes is passed through the levee and the covering or sheathing for the furnishing of water to farm lands adjacent to the levee, each pipe having a collar secured to the sheathing to prevent leakage. The bulkhead is preferably one to two feet above high water mark, and has two feet of ground above it.

VEHICLE BRAKE. — Alfred L. Hagen, Franklin, and Frank E. Dyer, Mount Desert, Me. This brake is designed more especially for road wagons and other vehicles. The front end of the vehicle body is fitted to slide on the king bolt, and a chain or rope connected with an arm on the ordinary brake mechanism is connected with one of two differential wheels on the rear axle, a rod being connected with a chain on the other wheel and also with the rear axle, the invention also including other novel features. The brake is intended to be entirely automatic in its action, the shoes being applied with more or less force according to the load and the steepness of the grade, while all strain is taken off the team.

WEIGHT FOR HORSES' HOOFS.—George R. King, Dallas, Texas. This is a toe or side weight having a stud projecting therefrom at its lower end for engaging a shoe, a plate being hinged to the weight adjacent to the stud, and a spring supported on the plate to bear on the stud and maintain the weight in place. The weight may be applied to any part of the hoof, either at the toe or sides, and is designed to adjust itself to the inclination of the hoof, being self-locking and effectively held against rattling, while being readily attachable and detachable.

BEDSTEAD FASTENING. — Henry R. Robbins, Baltimore, Md. This improved fastener includes the side rail section and the section attached to the head or foot board, the end section being composed of a latch plate having a handle projecting through a slot in the face plate whereby the latch plate may be set to unlatched position. The latch plate has notches in its front edges for the bearing roll, and on its rear edges has runner-like lugs, the bearing roll and the face plate being fitted over the latch plate. The device is very simple, and forms a secure and easily manipulated fastening.

BED DRAWER ATTACHMENT.—Leonia Mabee, Paris, Texas. A bed drawer, according to this improvement, is arranged to slide beneath the usual mattress support, thereby doubling the capacity of the ordinary bedstead, and providing for the accommodation of four persons instead of two. The bedstead has an opening in its side in which the drawer slides, and a folding head piece and legs are hinged to the drawer and adapted to fold parallel against the side rails of the bed drawer.

TOY OR PUZZLE. — Philip J. Hogan, Negaunee, Mich. This is what may be styled a "push box" puzzle, a box which may be held in the hand having its bottom marked in differently colored sections, while on the bottom beneath a glass cover are several variously marked cubes, each side of each of which represents different values, the cubes being moved and tossed to different positions and changes of face on the field by the movement of the box, the numerous combinations possible affording opportunities for playing many interesting games, a chart also being provided for use in connection with the box.

GAME APPARATUS.—Albert Cromwell, Philadelphia, Pa. A circular game board with flanged edge and concaved center has pins supporting tags around its edges, and the top of the board is divided into differently colored sections. To play on the board a top is used having facets on its sides numbered to correspond with the sections of the board, and a circular marker is used in connection with the top, the marker being perforated so that it may be dropped on the spindle of the top. The game may be played by four persons when the board is divided into eight parts, chips being used by the players, and the holder of the tag corresponding to the space on which the marker strikes after the top has been spun "takes the pot."

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

PRIMARY BATTERIES. By Henry S. Carhart. Boston: Allyn & Bacon. 1891. Pp. 193. Price $1.50.

The subject of the construction of primary batteries and of their tests, the theory and mathematics of the subject, are excellently treated in this work, which may be said to have a larger scope as coming from an American source. The grouping of the cells is not very thoroughly treated, but we notice with pleasure that the grouping of batteries for the quickest action and introduction of the time constant is developed, something usually omitted.

SCREWS AND SCREW MAKING. With a chapter on the milling machine. Britannia Company. Colchester, England. Pp. vii, 208. Price $1.25.

This work claims to be the largest volume devoted entirely to screws and screw making, and consists largely of the contents of committee reports and tabulations on screw systems of different nations, with illustrations of machines for making screws, and exhaustive tables. One very useful chapter is devoted to arithmetical rules for calculating wheels for cutting screws on a lathe.

TRANSITION CURVE FIELD BOOK. By Conway R. Howard. New York: John Wiley & Sons. 1891. Pp. 109. Price $1.50.

The object of this work is to furnish a practical method of determining a curve in railroad surveying, for connecting circular curves with tangents. The book will have to speak for itself, and it will, no doubt, be very useful to railroad engineers.

A TREATISE UPON WIRE, ITS MANUFACTURE AND USES. Embracing comprehensive descriptions of the constructions and applications of wire ropes. By J. Bucknall Smith. Offices of *Engineering*, London. John Wiley & Sons, New York. 1891. Pp. xxiii, 347. Price $3.

The manufacture of the different kinds of wire used in the arts, for the transmission of power, for structural purposes, etc., its transportation by rail, and all the most interesting details of wire engineering, are treated in this elegant work. The illustrations, paper, and type are beyond all criticism, suggesting an absolute *edition de luxe*. The subject is treated, not at all from an English standpoint, but American practice is given full prominence.

CATALOGUE OF MINERALS AND SYNONYMS. By T. Egleston. New York: John Wiley & Sons. 1891. Pp. 377. Price $2.50.

The present catalogue was commenced in the year 1867 and contains, it is claimed, several thousand more names than any other heretofore published. The indexes of sixteen leading works on mineralogy have been utilized to make the catalogue, as far as possible, a complete table of mineralogical synonyms in different languages.

REPORTS ON THE OBSERVATIONS OF THE TOTAL ECLIPSE OF THE SUN, December 21, 22, 1889; and of the total eclipse of the moon, July 22, 1888; to which is added a catalogue of the library published by Lick Observatory. Sacramento, Cal. 1891.

Several reports of the Lick Observatory are here bound together with some very beautiful silver prints of eclipses, together with other illustrations. It is an interesting work and shows what the Lick Observatory is now doing.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(3435) M. O. B. asks: After a fire stream of water has reached its natural height, how much higher can it be forced by steam fire engine, or in case the nozzle of hose be brought 100 feet higher than the water's level, will that be any advantage in forcing water higher than when hose is connected with steam fire engine at base of building? Give the difference between the nozzle being 100 feet high and nozzle placed at base of building. A. With 70 lb. fire pump pressure, you can throw a three-quarter stream a little over 100 feet high, while the hydrostatic height due to the above pressure is 161 feet, so that you could with the hose extended to that height still throw a stream 30 or 40 feet higher, the friction of the hose making the difference between the hydrostatic height and the jet height.

(3436) L. W. B. asks: What process to use to bronze a gun, and bring out the colors on a Damascus barrel, without rusting. And for polishing, which is the best, beeswax or a lacquer; if lacquer what kind? A. The browning of gun barrels cannot be done without rusting. You can blue stain by first cleaning and polishing, and wipe with a solution of one part protochloride of antimony, one part nitric acid, two parts hydrochloric acid, then rub the surface with a piece of green young oak wood until the desired blue color is produced. Then warm and rub the barrel with paraffine or beeswax, or if a varnish is desired, wipe with a little copal on a rag.

(3437) F. H. V. asks: 1. Does the density of the atmosphere have any effect on the focus of a lens? I should think as the atmosphere gets denser it would approach more nearly the density of the lens and lessen the refractive power of it, thereby increasing the focal distance of the lens. Is this correct? A. The density of the atmosphere does affect the focal distance of a lens, but ordinary changes are not appreciable. 2. I have an instantaneous shutter, which has its slide made of vulcanized rubber. Sometimes the slide warps so badly that it prevents the shutter from working. What can I do to prevent the slide from warping? A. Dress the slide a little thinner, so that it will run loose, and varnish with shellac.

(3438) L. F. S. says: On a plantation for sugar that I have charge of as engineer they are using water from a bayou in which there is a quantity of grass and leaves that produce a fermentation in the boilers. It forms a foam that prevents us from knowing the level of water. Can you give me any receipt to stop the fermentation in the boilers? A. You can only lessen the amount of vegetable matter in the boilers by excessive blowing off. Otherwise filtration will be in order, by the construction of an artificial filter bed of sand; or if the soil is sandy at reasonable depths, a system of driven wells attached to the pump would give you cleaner water than the open stream.

(3439) J. D. L. asks how to find the required voltage and amperage for a motor of a certain horse power. A. 746 watts constitute an electrical horse power. A volt multiplied into an ampere is a one horse power watt, so that, for example, 1 ampere multiplied into 746 volts will give you a H. P.; or 1 volt multiplied into 746 amperes would give you a H. P.; or 2 volts multiplied into 373 amperes = 1 H. P; or 373 amperes multiplied into 2 volts = 1 H. P. and so on. Any other given number of volts which multiplied into a given number of amperes will produce 746 = 1 electrical horse power. For such calculations, we refer you to the "Arithmetic of Electricity," $1 by mail.

(3440) R. writes: Please give the component parts of concrete, *e. g.*, how much cement, sand and gravel? A. Best Portland cement, 1 part; clean sharp sand, 1 part; broken stone, egg size, 1 part.

(3441) H. D. P. asks how the face and head are prepared for making a plaster cast of the face and head with nose and ears attached. A. Casting from life is very unpleasant for the person operated upon, and especially when the face is moulded, the pain is considerable. The face is first greased well with vaseline, the eyelashes and eyebrows being well buried in pomade or clay and the small hairs well smoothed down. Whiskers, etc., should be well coated with clay. Quills are inserted in the nostrils for respiration. Then when the patient is lying in a recumbent position, the plaster is laid on. The patient must not move or laugh or speak until the plaster is set. The plaster is mixed with warm water, as the plaster sets better than with cold water. When the cast is sufficiently set, it is removed. This is the painful part of the operation. A hand can be done by thrusting it in a basin of plaster, then placing it on a towel in desired position. As the plaster sets, lay a strong thread on the wet plaster along the hand down the middle finger. A second thread may be laid from the wrist to the thumb. The object of these threads is to make divisions in the mould, and thus enable the hand to be withdrawn. Now lay on the plaster over the whole to a sufficient thickness. When it is nearly set (still soft and wet), take the ends of the threads, and by jerking them sharply through the plaster, sections are made in the mould. In a few minutes the plaster is hard and the mould may be burst asunder at the divisions cut by the thread and the hand released. Fractures which will probably occur in thin parts of the mould must be cemented carefully in their places after they are dry by a solution of shellac in alcohol. Limbs and even the entire figure can be moulded in this manner. Professional moulders should be employed in taking casts of deceased persons.—From "Scientific American Cyclopedia of Receipts and Notes and Queries."

(3442) G. E. H. asks how to preserve plants, flowers, etc., for a botanical cabinet. A. The following answer is from the new "Scientific American Cyclopedia of Receipts, Notes and Queries." A method of preserving the natural colors of flowers, recommended by R. Hegler in the *Deutsche Botanische Monatshefte*, consists in dusting salicylic acid on the plants as they lie in the press, and removing it again with a brush when the flowers are dry. Red colors in particular are well preserved by this agent. Another method of applying the same preservative is to use a solution of 1 part of salicylic acid in 14 of alcohol by means of blotting paper or cotton wool soaked in it and placed above and below the flowers. Powdered boracic acid yields nearly as good results. Dr. Shouland, in the *Gardeners' Chronicle*, recommends as an improvement in the method of using sulphurous acid for preserving the color, that in the case of delicate flowers they might be placed loosely between sheets of vegetable parchment before immersion in the liquid, so as to preserve their natural form.

(3443) H. G. A. asks: What is the correct atomic weight of oxygen? Is it 8 or 16 when given in a table in which hydrogen is 1? Is atomic weight not based upon hydrogen as the standard unit 1, and as water is 1 hydrogen to 8 oxygen, should oxygen not be represented as 8? I find some tables give hydrogen 1, oxygen 8, while others give hydrogen 1, oxygen 16. Where oxygen is given as 16, should hydrogen not be 2? A. Water contains 2 volumes of hydrogen to 1 volume of oxygen. By Avogadro's law the molecules and their constituent atoms are supposed to occupy the same volume when in the gaseous state. Hence a molecule of water is supposed to contain 2 atoms of hydrogen and 1 atom of oxygen. This gives the basis for hydrogen 1 to oxygen 16 by weight. The relative weights differ, as you indicate, in old and new system tables, but this is compensated for by a corresponding difference in the old and new system formulas.

(3444) J. J. H. writes: Having many calls for covering wood, iron, or steel pulleys and band wheels with a tough manila paper, I can find no cement powerful enough to cause paper to properly adhere to the face of the wheel, when subjected to the proper load and speed. I want something that will cause the paper to keep its place on face of pulley or wheel under all circumstances and conditions of weather, something I could feel safe in recommending to my customers. Do you know of any reliable cement and the process for making it, or could you in any way inform me where I could get it? Should feel very thankful for any information leading to the discovery of the cement I want. A. See Notes and Queries, No. 3213, August 8, 1891, papering a pulley.

(3445) F. G. H. asks how to etch silver. A. The following answer is from the new "Scientific American Cyclopedia of Receipts, Notes and Queries." In press. Silver is etched in a similar manner to brass or copper. Prepare a ground (Callot's) composed of linseed oil varnish and mastic, heat until the wax is melted, filter, and apply with a brush and heat until varnish stops smoking. Cover every portion of the silver carefully with the ground, scratch the design with an etching needle, then etch with the following solution: 16 parts nitric acid (sp. gr. 1·40) is added to 160 parts water. Dissolve 6 parts potassium chlorate in 100 parts of water. Mix the two solutions and etch. Examine the piece frequently, and when sufficiently etched, remove the ground with alcohol.

(3446) W. E. V. asks: How can I straighten pieces of bent or crooked lancewood, out of which I wish to make a fishing rod? Also I have some paraffine wax which has grease in it; how can I take it out? A. Steam the wood and slightly bend in opposite direction from the natural bend and dry. It is cheaper to buy fresh paraffine than to free what you have from grease. Or you can try boiling in solution of caustic soda.

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